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Pilot Study to Incorporate Validation Procedures in the State of Hawaii Commercial Marine License Reporting Program for Charter Fishing Boats (For-Hire Sector)

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EXECUTIVE SUMMARY

The goal of this project, funded by the NOAA Fisheries Marine Recreational Information Program (MRIP) in 2009 and 2010, was to document the Hawaii charter fishing (for-hire) sector's level of compliance with the Hawaii Division of Aquatic Resources (HDAR) commercial fishing reporting system and to identify possible changes to improve the system. State regulations require charter fishing boat operators to document every fishing trip through Commercial Marine License (CML) monthly commercial fishing reports.

In 2009, dockside surveys were conducted at four major charter fishing boat harbors in the state of Hawaii, one on each of the most-populated Hawaiian Islands. Charter boat trips from the four chosen harbors accounted for more than 70% of the total charter boat trips in the state based on the 2007 CML reports. Surveyors observed charter vessels exiting and entering each of these harbors on 30 consecutive days (in one month) to measure effort levels by charter vessels. These on-the-ground counts were compared to effort levels reported by charter vessel operators in their CML reports for the same time periods.

The survey at all four harbors in November 2009 indicated that the proportion of fishing trips reported to HDAR compared to the survey figures averaged 64% for boats on the CML charter list, varying from 48% to 70% across harbors. In addition to underreporting, "no reporting" contributed to the low report rate: 10% of the observed trips were taken by listed boats that submitted DNF (Did Not Fish) reports or did not submit fishing reports. Also, there appeared to be many charter trips by boats that were not on the CML charter boat list, especially at the two most active harbors. Including these likely charter trips, the reported trips only accounted for fewer than half (48%) of the observed fishing trips in November 2009. At the two harbors where fishing was also monitored in March and July 2010, there were more fishing trips in these months than in November (mainly as a result of increased trips conducted by each boat). However, the report rates for fishing trips were similar across months within a harbor.

The catch for billfish (including blue marlin, striped marlin, and short bill spearfish) reported in the 2009 CML reports at the largest charter harbor was compared with charter desk catch reports; the CML report rates were 61%-68% for kept catch and 76%-89% for released billfish. The billfish catch report rate was comparable to the trip report rate.

The trip report rate for boats on the CML charter list could be improved within the current reporting system to adequately capture the charter fisheries in Hawaii. The following changes could help reduce nonreporting and underreporting:

1) Owners and major captains of some charter corporations may own and operate multiple boats, but they may only put one boat name (or name combination) in the CML application (renewal if they subsequently buy a new vessel) and may often submit CML reports only for one boat name (or name combination). Charter fishermen should be advised to submit separate fishing reports for each of their boats. The CML application and renewal could be modified so that multiple vessel names can be included in one form.

2) The operating captains could be held responsible for reporting the charter trips rather than the corporation owners or captains who are not on the vessel. When one person reports for boats that he is not on physically, he or she may neglect trips without catch and underreport the trips. Although some are not owners, charter vessel operators without a CML should obtain their own license and report their trips when the owners/licensed captains are not on board.
3) A major "outreach and education" project should be conducted with the charter industry to ensure reporting requirements are fully understood and more complete and accurate reports to HDAR are submitted. Accurate catch reporting is important for monitoring the health of the target fisheries. Charter fishermen should also be informed that accurate reporting for all trips is as important as catch reporting because of the economic impacts of all trips (including trips without catch) and because of the need for accurately estimating catch rate. More robust data quality checks and feedback mechanisms could be developed and implemented within the HDAR data processing system.

Table of Contents

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INTRODUCTION AND BACKGROUND

Recreational fishing in Hawaii is monitored by the Hawaii Marine Recreational Fishing Survey (HMRFS), a collaborative program between the National Marine Fisheries Service (NMFS) and the Hawaii Division of Aquatic Resources (HDAR). HMRFS is part of the NMFS Marine Recreational Fisheries Statistical Survey (MRFSS). MRFSS started in Hawaii in 1979 but lasted for only 2 years, partially because of funding and staffing restrictions, but was reinstituted in 2001. The MRFSS is made up of three components: 1) coastal household telephone surveys (CHTS) for information on shore and private/rental boat fishing efforts; 2) access point angler intercept survey (APAIS) for catch data from shore, private/rental boat, and for-hire (mostly charter boat in Hawaii) anglers; and 3) for-hire survey (FHS) for effort data by charter boat captains about trips taken for hire. Currently, HMRFS does not include surveys of the for-hire sector. Although there are no regular charter fishing surveys, previous studies have investigated Hawaii charter fisheries including motivations, expenditures, and valuation of charter patrons and the sociology and cost and earnings of charter fleets (e.g., Samples et al., 1984, Samples and Schug, 1985; Walker, 1996; Hamilton, 1998; O'Malley and Glazier, 2001).

A for-hire survey for charter fishing catch and trips (as part of HMRFS) in Hawaii began mid-year 2003. However for-hire estimates were not generated due to low participation for field intercept surveys (for charter boats) in some areas (especially on Oahu) and low response rate for the FHS telephone surveys. After struggling for several years with the for-hire sector to collect adequate data, the for-hire component was dropped from HMRFS in January 2007. However, fishermen in Hawaii taking marine species for commercial purposes are required by the State of Hawaii to have a Commercial Marine License (CML) and submit monthly commercial fishing reports[1] to HDAR. In addition, any person providing vessel charter services in the State for the taking of marine life shall obtain a CML. In theory, there is a census logbook system in effect for charter boats in Hawaii and, currently, figures on effort (trips) and catch of for-hire fishing are based on monthly CML reports. However, there are known shortcomings with the current CML monthly reporting program for the charter boat sector. For example, based on safety equipment examinations, the U.S. Coast Guard found that significant numbers of for-hire vessels were unlicensed in Hawaii and/or were not reporting to HDAR. Licensed charter operators may have inaccurately reported trips and catch as a result of recall errors associated with monthly reporting.

Members of the For-Hire Work Group in the NMFS Marine Recreational Information Program (MRIP) submitted a proposal to MRIP in January 2009 to identify and document gaps in the Hawaii for-hire reporting system, such as the magnitude of nonreporting and underreporting and to provide recommendations for improvements. This project continued in 2010 to compare underreporting/nonreporting in different seasons. As a result of logistical constraints, the 2009 survey was conducted in November although that was known to be a low season. Based on the CML reports, the most active months occurred in the summer at Honokohau, the largest charter boat harbor in Hawaii. Therefore fishing activity was surveyed there again in March and July of 2010. For comparison, fishing activity was also monitored in July 2010 at a harbor in Maui

[1] http://www.state.hi.us/dlnr/dar/fishing_commercial.html

(Lahaina) where seasonality was not clear according to the CML data. This report includes the results from both sets of surveys.

METHODS

A boat activity survey form (Appendix A) was developed prior to a pilot survey at two Maui harbors in August 2009 to test and refine survey methodology and instruments. This form was used by field surveyors who strategically placed themselves to record all boats including charter boats departing from or returning to the port being surveyed. The surveyors were asked to record all boat activities including fishing, diving, snorkeling, sailing, parasailing, etc. at individual harbors. They also provided for surveyors entering "Yes", "No", or "Unknown" in the column "Charter" of the survey form based on their best judgment (see Appendix A). For the analysis in this paper, we only included data from boat trips where the entry "Yes" was recorded in the column "Fishing" of the survey form. For the pilot survey, surveyors observed boat activity from 6:00 to 17:00 at Lahaina Harbor for one week and at Maalaea Harbor for another week. Maalaea Harbor has much more wind, causing few boats to go out in the afternoon, or out for a second trip. Lahaina Harbor is the popularly known charter fishing harbor on Maui with a fueling dock inside the harbor and for vessels that ferry people to Lanai or to other boats. The results from these test surveys helped determine the best survey times for the full surveys conducted in November 2009 and 2010.

The major part of the survey was conducted in November 2009 for 30 consecutive days at four charter harbors including Honokohau Harbor (Island of Hawaii, aka the Big Island), Lahaina Harbor (Maui), Nawiliwili Harbor (Kauai), and Kewalo Basin (Oahu). The survey was conducted at the harbors every day from 8:00 to 17:00. Similar to the pilot survey, the surveyors observed and recorded all boat activities including fishing boat activities. Captains, crews, and patrons (on charter boats) were not interviewed for the survey so that CML monthly reporting by captains would not be impacted. In March and July 2010, the survey was conducted again at Honokohau Harbor where the CML reports indicated strong seasonality in fishing activities. In July 2010, fishing activity was also monitored at Lahaina Harbor where there was no strong seasonality based on CML reports. Daily trips observed from individual boats in surveys were compared with those from the CML monthly reports. In Hawaii, charter fishermen are required to report all fishing trips (chartered and unchartered). Since fishermen were not interviewed, the trips by charter boats did not confirm the type of trip (chartered or unchartered). For comparison, all fishing trips by charter boats in CML monthly reports were included (chartered and not chartered) to compare with observed fishing trips in the survey from those vessels.

The reporting rate for vessels from each of the harbors surveyed was estimated based on the reported fishing days for the charter boats that could be identified in the CML system (including registration files and fishing reports). In Hawaii, CML and the report are for a fisher not for a fishing boat. There is not an "official" directory for charter vessels in Hawaii. When fishermen apply for or renew their CML, they can enter "Y" or "N" for charter under the vessel information. A list of active charter vessels can be indirectly extracted from CML registration files. In addition, there is an entry on the monthly CML report asking whether a trip was a

charter trip. A list of charter boats for a particular month can be produced based on the two data sources. The list changes from month from month since the list of active fishermen changes. The reported fishing days were compared with the observed days fished for all these boats to estimate the report rate for individual boats and individual harbors. Fishing days rather than fishing trips were used for report rate calculation. Some charter vessels were observed to take second trips in a single day, and it is possible that some vessels took multiday trips. It is difficult to identify these second trips in CML reports because fishermen do not separate trips within a day. For simplicity, we adopt MRFSS definition for a fishing trip as fishing during part or all of one "waking day" in one fishing mode (i.e., shoreline fishing, fishing on a private boat, or fishing on a for-hire vessel). To account for all trips in the CML reports, data were sorted by vessel and fishing date and only one record was maintained for each date and vessel name combination.

For some boats, the number of reported days fished was larger than the number of fishing days observed. For these boats, the fishing days reported in CML were called adjusted days fished and the report rate was calculated as the ratio of days in the CML reports to adjusted days fished (rather than ratio of days in the CML reports to observed days fished, which would be larger than 1). The discrepancies for these boats may have been due to lapses in the survey, ambiguity in the CMl system, or inexact reporting in CML reports. The surveyors might have missed some trips in the field and it is possible that the boats fished somewhere else but the trips were reported at the surveyed harbors[2].

The charter boats identified in the CML system did not include all possible charter boats because each charter fisherman can only have one vessel listed on their CML application/renewal form. Some fishermen operate on multiple charter boats and they may report the monthly fishing reports under one vessel name only (vessel name is in the header of the fishing report). The reported trips for one boat name in CML may include trips from other vessels the fishermen operated in the month. Some fishermen had a name combination (such as "Catch Fish 1/Catch Fish 2") or a generic name (e.g., boat name "Catch Fish" can include boats "Catch Fish Again", Catch Fish Too", and "Catch Fish Big") for the vessel name in their CML reports. For those boat names, the observed fishing days from multiple vessels under one boat name or name combination were included for report rate calculation. Some fishermen tried to separate trips from different boats under one boat name or boat combination if multiple boats fished in a day. Such trip records were carefully examined (compared with field observations) and counted appropriately. In addition to the charter boats identified with the CML system, there were a significant number of what our survey team identified as "possible" charter boats. Even though these boats could not be confirmed as charter boats with the current CML system, they were regarded as likely charter boats based on the charter boat list at the Hawaii Fishing News website (http://www.hawaiifishingnews.com) and the list of boats that had charter trips in recent years. For these vessels, fishing trips with ≥ 4 people on board were counted as likely charter trips and they were not included in the major result tables (only included in summary tables of other trip information). Based on HMRFS for-hire survey (2003-2006), the minimum number of patrons was two for charter trips surveyed. On most charter boats in Hawaii, there is one captain and one crew member. Therefore, four or more people was used to as a criterion for these likely charter boats.

[2] CML reports are intended to report the port from which a vessel returns

For the entire year of 2009, the catch for billfish (blue marlin, striped marlin, and shortbill spearfish) recorded from the private charter desk in Honokohau was compared with catch from the HDAR 2009 CML reports for captains identified with charter fishing vessels. The charter desk operates the weigh scales at the fuel dock in Honokohau Marina. Their catch report is published at its website (http://www.charterdesk.com) and in Hawaii Fishing News. The catch report for more than 60 boats is said to cover all billfish caught /released and tuna larger than 100 lbs. Catch recorded at the charter desk may include catch from nonchartered trips taken by charter boats. For the boat-based comparison with reports from the charter desk, catch and release from the CML reports included records from chartered trips and nonchartered trips.

The historic HMRFS data for charter vessels (2003-2006) were also compiled and compared with CML catch data for these years. Harbors with relatively complete survey data were selected and the catch rates calculated as number of fish per angler trip at these sites were compared with the rates (number of fish per boat trip) from CML reports., Catch rate rather than total catch was compared because the total expanded effort and catch estimates from the charter survey were not available when HMRFS surveying of charter fishing trips was suspended. The effort unit from CML reports is boat trips and the unit from the charter survey was angler trips. The correlations were analyzed between the 2 rate estimates (average of all reported boat trips in CML or all surveyed angler trips in HMRFS surveys at a harbor) from individual waves in 2003-2006 and the slopes from regressions (and ratios) between these 2 rates were calculated.

RESULTS

The study focused on the comparisons between fishing activities observed by surveyors and the fishing trips reported by charter fishermen at Honokohau Harbor, Hawaii (Big Island), Lahaina Harbor (Maui), Nawiliwili Harbor (Kauai), and Kewalo Basin Harbor (Oahu). Catch data from other sources (charter desk and a previous charter survey in HMRFS from 2003 to 2006) were also used to compare with total catch and catch rate in the fishermen reports.

Maui Pilot Surveys

Test surveys were carried out in August 2009 at two harbors in Maui. Charter fishing is very active at these two harbors. At Maalaea harbor, 23 charter trips from six boats were observed on August 23-30 (see Table B1 in Appendix B). The surveyors were able to observe both departure and return times for 21 (out of 23) trips during the survey time from 6:00 to 16:00. At Lahaina Harbor, more than 70 charter trips were recorded from 18 boats on August 16-22. About half of the trip records were missing either departing time or return time, suggesting that these boats departed earlier than 6:00 (the survey start time) or returned after the surveyor left. Based on these results, we decided to start at 8:00 for the major surveys (for 30 consecutive days in November). The shortened survey duration (8:00 to 17:00) was more practical and had the ability to record at least one departure or return of each observed trip in test surveys.

Activity Surveys in Hawaii (Big Island)

Activity/effort surveys were conducted at Honokohau Harbor in November 2009 March 2010 and July 2010. In this paper, the terms "registered", "listed", or "licensed" charter vessels/boats (unless they are specifically defined otherwise) are for boats indicated in fishermen's CML applications/renewals as intended for charter fishing or for boats associated with charter fishing trips reported in a month. In many cases, the terms "boats" or "vessels" refer to the fishermen associated with the boats/vessels. In November 2009, 46 charter vessels were shown in CML reports (required for commercial fishermen and charter fishermen) for fishing trips (including chartered and nonchartered trips, boats Boat 1-46 in Table 1). There were 8 DNF (Did Not Fish) reports (from fishermen associated with boats DNF1-8) and no reports for four boats (NR1-4), and these boats (DNF1-8 and NR1-4) could be identified as charter boats within the CML system. For the 46 boats with fishing trips reported in CML reports, there was a different fisherman reporting for each of these 46 boats in November 2009. When multiple trips were reported for a boat, all trips were reported by the same fisherman. Six of the 46 vessels had charter trips in CML reports, but they were not indicated as charter boats in the current CML application and renewal forms. Four charter vessels (NR1-NR4[3], Table 1) listed by fishermen as intended for charter fishing in the CML application and renewal forms (current in November 2009) were not in the fishing reports, including the DNF (Did Not Fish) reports, but surveyors observed fishing trips from three of them (NR2-4). Eight fishermen (seven of them were captains) associated with the listed charter boats filed the DNF reports. Trips from four of these boats (DNF1, DNF3-4, DNF6, Table 1) were observed in the field, but these boats were not shown in the CML reports for any fishing trips.

For 8 of the 46 vessels that showed trips reported in CML reports , the survey showed that the daily fishing trips were at least twice as many as those reported in CML (including both chartered and nonchartered trips reported in CML for the registered boats). The total fishing days recorded in CML reports were 251 (47 nonchartered) and the observed fishing days were 329. For some vessels (such as Boat 10 and Boat 23), the number of fishing days in CML reports was larger than the number of days observed in the field due to possible lapses in the survey or inexact reporting in CML reports. The observed fishing days were adjusted for these vessels so that the maximum report rates (days in CML / adjusted days) for individual vessels are 1 (Table 1).

[3] NS refers to Not Submitting reports [better to call it NR = Not Reporting or No Reports]

Table 1.--Honokohau Harbor (Hawaii). November 2009 survey results for the number of fishing days reported in CML monthly report (Days in CML) vs. observed fishing trips (Observed Trips), fishing days (Observed Days Fished), and adjusted fishing days (Adjusted Days Fished). Adjusted days are mostly equal to fishing days observed (Days fished) and are only replaced with days in CML when days in CML > fishing days observed. DNF boats (DNF1-8) submitted DNF reports. NR boats (NR1-4) are the boats with no reports submitted.

Boat	Days in CML	Observed Trips	Observed Days Fished	Adjusted Days Fished	Report Rate
Boat 1	1	3	3	3	0.333
Boat 2	1	4	4	4	0.250
Boat 3	6	7	7	7	0.857
Boat 4	7	7	7	7	1.000
Boat 5	57	61	52	57	1.000
Boat 6	1	1	1	1	1.000
Boat 7	1	1	1	1	1.000
Boat 8	5	11	11	11	0.455
Boat 9	2	2	2	2	1.000
Boat 10	7	5	5	7	1.000
Boat 11	1	1	1	1	1.000
Boat 12	3	2	2	3	1.000
Boat 13	10	15	14	14	0.714
Boat 14	5	3	3	5	1.000
Boat 15	7	14	13	13	0.538
Boat 16	2	2	2	2	1.000
Boat 17	6	9	9	9	0.667
Boat 18	3	2	2	3	1.000
Boat 19	2	3	3	3	0.667
Boat 20	4	4	4	4	1.000
Boat 21	4	4	4	4	1.000
Boat 22	3	2	2	3	1.000
Boat 23	3			3	1.000
Boat 24	4	7	7	7	0.571
Boat 25	2	2	2	2	1.000
Boat 26	2	7	6	6	0.333
Boat 27	2	4	4	4	0.500
Boat 28	2	2	2	2	1.000

Table 1 (continued)

Boat	Days in CML	Observed Trips	Observed Days Fished	Adjusted Days Fished	Report Rate
Boat 29	17	15	15	17	1.000
Boat 30	3	11	10	10	0.300
Boat 31	8	11	11	11	0.727
Boat 32	3			3	1.000
Boat 33	6	5	5	6	1.000
Boat 34	2	6	6	6	0.333
Boat 35	2	2	2	2	1.000
Boat 36	2	2	2	2	1.000
Boat 37	3	3	3	3	1.000
Boat 38	2	2	2	2	1.000
Boat 39	7	11	11	11	0.636
Boat 40	5	5	5	5	1.000
Boat 41	8	9	9	9	0.889
Boat 42	2			2	1.000
Boat 43	1	3	3	3	0.333
Boat 44	10	8	8	10	1.000
Boat 45	9	12	12	12	0.750
Boat 46	8	2	2	8	1.000
NR1		0	0	0	
NR2		11	11	11	
NR3		12	12	12	
NR4		7	7	7	
DNF1	0	4	4	4	0
DNF2	0	0	0	0	
DNF3	0	1	1	1	0
DNF4	0	13	13	13	0
DNF5	0	0	0	0	
DNF6	0	2	2	2	0
DNF7	0	0	0	0	
DNF8	0	0	0	0	
Sum	251	342	329	360	

In the November 2009 survey, several boats (Boat 13, Boat 15, Boat 26, and Boat 30 in Table 1) were observed to take a second trip in a day, once for each boat. Boat 5 (a boat name combination in CML reports) covered for 3 boats under one charter fishing company. All 3 boats took a second trip within a day multiple times. For Boat 5 with 3 boats, the owner intended to separate trips from different boats on the same day with different fishing hours in a day in CML. Thus, more than 30 boat fishing days could be identified for boat name combination Boat 5 in CML reports (Table 1). However, second trips (on the same day) from individual boats (Boat 5, Boat 13, Boat 15, Boat 26, and Boat 30) could not be identified or separated from the first trips in CML reports. In Table 1, the comparison (report rate) for trips from CML reports and the survey were based on fishing days.

Table 1 includes confirmed charter boats for Honokohau Harbor in November 2009. They were reported as vessels by charter fishermen in the November fishing reports or listed as vessels by current charter fishermen. Twenty-seven vessels (not in Table 1) could possibly be charter boats based on the list of boats that reported charter trips in recent years (but not in November 2009) and based on the charter boat list at the Hawaii Fishing News web site (http://www.hawaiifishingnews.com/). These boats could not be identified as active charter boats in the CML system as of November 2009 (i.e., there were no CML reports for charter trips from these boats in November, and these boats were not listed as charter boats by current fishermen in November). Eight of these boats reported charter trips in other months in 2009 and no fishing trips (chartered or not) were reported in November for these eight boats. For the rest of the 27 boats identified above that did not report any charter trips in 2009, only two vessels reported in CML monthly reports for nonchartered trips in November and in 2009. Generally speaking, local private and commercial fishing vessels that are not charter boats typically have fewer than four 4 people on board. The trips observed in the survey with ≥ 4 people on board from these 27 boats were counted as potential charter trips, and there were ~ 130 such trips surveyed in November 2009 (labeled as "other likely charter trips in Table 5). These trips were observed in the field but they could not be identified in CML reports and were not included in Table 1.

In March 2010, 54 charter vessels were shown in the CML reports as having taken fishing trips (Boats 1-54, Table 2). Two vessels (Boat 12 and Boat 36) reported fishing trips at ports not including Honokohau Harbor. For 17 of these vessels, the surveyed fishing days were at least twice as many as those reported in CML. Six charter boats (NR1-6) did not submit CML reports, but fishing trips were observed from 4 of them. Nine boats submitted DNF reports to HDAR, whereas the field survey observed fishing trips for 5 of these vessels. Twenty-eight other vessels (not in Table 2) could be charter boats and the survey observed 214 fishing days when there were ≥ 4 people on board.

Table 2.--Honokohau Harbor, March 2010, Number of fishing days reported in CML monthly report (Days in CML) versus fishing trips observed by the survey (Observed Trips), fishing days (Observed Days Fished), and adjusted fishing days (Adjusted Days Fished). Adjusted days fished are equal to fishing days observed (Observed days fished), for most boats, and the adjusted days are replaced with days in CML for boats where days in CML > fishing days observed so that report rates for individual boats are ≤ 1.

Boat	Days in CML	Observed Trips	Observed Days Fished	Adjusted Days Fished	Report Rate
Boat 1	6	8	8	8	0.750
Boat 2	18	19	19	19	0.947
Boat 3	10	14	13	13	0.769
Boat 4	70	120	87	87	0.805
Boat 5	6	10	10	10	0.600
Boat 6	5	12	10	10	0.500
Boat 7	5	22	16	16	0.313
Boat 8	1	5	5	5	0.200
Boat 9	9	10	10	10	0.900
Boat 10	10	8	8	10	1.000
Boat 11	11	9	9	11	1.000
Boat 12		1	1	1	
Boat 13	6	7	7	7	0.857
Boat 14	6	6	6	6	1.000
Boat 15	5	13	12	12	0.417
Boat 16	22	27	21	22	1.000
Boat 17	2	2	2	2	1.000
Boat 18	13	9	9	13	1.000
Boat 19	8	10	10	10	0.800
Boat 20	2	2	2	2	1.000
Boat 21	7	3	3	7	1.000
Boat 22	5	6	6	6	0.833
Boat 23	1	4	3	3	0.333
Boat 24	15	9	8	15	1.000
Boat 25	2	4	4	4	0.500
Boat 26	15	0	0	15	1.000
Boat 27	11	13	13	13	0.846
Boat 28	3	3	3	3	1.000
Boat 29	5	12	10	10	0.500
Boat 30	5	19	18	18	0.278
Boat 31	1	2	2	2	0.500
Boat 32	16	16	16	16	1.000
Boat 33	6	20	19	19	0.316
Boat 34	10	12	12	12	0.833
Boat 35	8	6	6	8	1.000
Boat 36		2	2	2	
Boat 37	9	11	8	9	1.000
Boat 38	8	6	6	8	1.000

Table 2 (continued)

Boat	Days in CML	Observed Trips	Observed Days Fished	Adjusted Days Fished	Report Rate
Boat 39	10	19	16	16	0.625
Boat 40	2	6	6	6	0.333
Boat 41	3	5	3	3	1.000
Boat 42	2	3	3	3	0.667
Boat 43	7	7	7	7	1.000
Boat 44	4	4	4	4	1.000
Boat 45	2	8	8	8	0.250
Boat 46	2	4	4	4	0.500
Boat 47	4	9	8	8	0.500
Boat 48	2	3	3	3	0.667
Boat 49	6	11	9	9	0.667
Boat 50	5	3	3	5	1.000
Boat 51	12	12	11	12	1.000
Boat 52	4	7	7	7	0.571
Boat 53	5	12	12	12	0.417
Boat 54	9	1	1	9	1.000
NR1		20	17	17	
NR2		8	8	8	
NR3		10	10	10	
NR4		0	0	0	
NR5		15	14	14	
NR6		0	0	0	
DNF1	0	5	5	5	0
DNF2	0	2	2	2	0
DNF3	0	1	1	1	0
DNF4	0	1	1	1	0
DNF5	0	0	0	0	
DNF6	0	0	0	0	
DNF7	0	0	0	0	
DNF8	0	15	13	13	0
DNF9	0	0	0	0	
Sum	421	653	580	631	

In July 2010, 58 charter vessels were shown in the CML reports as having taken fishing trips (Table 3). For 12 of these 58 vessels, the observed fishing days were at least twice as many as those reported in CML. Five charter boats (NR1-5) did not submit their reports, but fishing trips were observed from 4 of them. Ten boats submitted DNF reports, but fishing trips were observed for 8 of these vessels. Thirty-two other vessels (not in Table 3) could be charter boats and showed 351 fishing days when there were ≥ 4 people on board.

Table 3.--Honokohau Harbor (Hawaii), July 2010, survey results for the number of fishing days reported in CML monthly report (Days in CML) vs. observed fishing trips (Observed Trips), fishing days (Observed Days Fished), and adjusted fishing days (Adjusted Days Fished). Adjusted days are mostly equal to fishing days observed (Observed Days Fished) and are only replaced with days in CML when days in CML > fishing days observed.

Boat	Days in CML	Observed Trips	Observed Days Fished	Adjusted Days Fished	Report Rate
Boat 1	18	24	21	21	0.857
Boat 2	15	16	16	16	0.938
Boat 3	62	136	82	82	0.756
Boat 4	16	16	16	16	1.000
Boat 5	6	25	24	24	0.250
Boat 6	11	18	18	18	0.611
Boat 7	9	8	8	9	1.000
Boat 8	25	33	28	28	0.893
Boat 9	14	12	11	14	1.000
Boat 10	20	16	16	20	1.000
Boat 11	7	7	7	7	1.000
Boat 12	4	5	5	5	0.800
Boat 13	5	19	16	16	0.313
Boat 14	16	27	22	22	0.727
Boat 15	3	5	5	5	0.600
Boat 16	10	10	10	10	1.000
Boat 17	15	15	15	15	1.000
Boat 18	4	4	4	4	1.000
Boat 19	8	27	24	24	0.333
Boat 20	21	15	15	21	1.000
Boat 21	12	14	14	14	0.857
Boat 22	4	2	2	4	1.000
Boat 23	14	0	0	14	1.000
Boat 24	9	11	11	11	0.818
Boat 25	4	7	7	7	0.571
Boat 26	6	6	5	6	1.000
Boat 27	6	5	5	6	1.000
Boat 28	10	17	15	15	0.667
Boat 29	8	13	9	9	0.889
Boat 30	5	21	20	20	0.250
Boat 31	19	16	15	19	1.000
Boat 32	11	7	7	11	1.000
Boat 33	10	10	9	10	1.000
Boat 34	9	21	21	21	0.429
Boat 35	24	21	21	24	1.000
Boat 36	27	21	21	27	1.000
Boat 37	11	23	19	19	0.579
Boat 38	12	12	12	12	1.000
Boat 39	14	22	21	21	0.667
Boat 40	10	15	13	13	0.769

Table 3 (continued)

Boat	Days in CML	Observed Trips	Observed Days Fished	Adjusted Days Fished	Report Rate
Boat 41	6	5	5	6	1.000
Boat 42	7	8	8	8	0.875
Boat 43	6	8	8	8	0.750
Boat 44	4	4	4	4	1.000
Boat 45	1	7	7	7	0.143
Boat 46	4	11	11	11	0.364
Boat 47	2	13	13	13	0.154
Boat 48	6	6	6	6	1.000
Boat 49	12	28	28	28	0.429
Boat 50	7	17	17	17	0.412
Boat 51	7	10	10	10	0.700
Boat 52	12	15	13	13	0.923
Boat 53	2	1	1	2	1.000
Boat 54	2	4	4	4	0.500
Boat 55	22	26	22	22	1.000
Boat 56	3	2	2	3	1.000
Boat 57	4	12	12	12	0.333
Boat 58	8	0	0	8	1.000
NR1		19	19	19	
NR2		0	0	0	
NR3		24	24	24	
NR4		5	5	5	
NR5		1	1	1	
DNF1	0	6	6	6	0
DNF2	0	8	8	8	0
DNF3	0	42	27	27	0
DNF4	0	0	0	0	
DNF5	0	6	6	6	0
DNF6	0	0	0	0	
DNF7	0	3	3	3	0
DNF8	0	3	3	3	0
DNF9	0	1	1	1	0
DNF10	0	1	1	1	0
Sum	629	998	885	946	

The trips reported and observed are summarized in Tables 4 and 5. More fishing trips (reported and observed) occurred in March than in November. July was the most active month. For the boats that reported non-zero fishing trips, the report rates were > 80% for more than half of the boats. Including trips from boats that did not report or reported DNF, the report rates for all registered boats ranged from 66.5% to 68.9% (last column in Table 4). A significant number of other likely charter trips occurred at Honokohau Harbor (Table 5) which would result in lower actual report rates. Many fishermen did not submit their monthly reports on time, especially in July 2010 (Table 5). In March and July 2010, more boats conducted multiple trips within a day (Tables 1-3 and 5).

Table 4.--Summary for trips for registered charter vessels at Honokohau Harbor including observed trips from boats that did not submit reports or submitted DNF (Did Not Fish) reports. The adjusted days fished in table are for the boats that reported taking trips. The numbers in parentheses are the number of boats.

Months	Days in CML	Adjusted Days Fished	Boats with Report Rate > 80%	Days from No Reporting or DNF	Report Rate for the Harbor
Nov 2009	251 (46)	310 (46)	30	50 (7)	0.697 (53)
Mar 2010	421 (54)	560 (54)	29	71 (9)	0.667 (63)
Jul 2010	629 (58)	842 (58)	34	104 (12)	0.665 (70)

Table 5.--Summary of other trip information at Honokohau Harbor including second (or multiple) trips taken within a day and other likely charter trips observed by the surveyors. Late reports are those that were not submitted by the 10th of the following month. The numbers in parentheses are number of boats.

Harbor	Late Reports	Name with Multiple Boats	Second Trips (Boats)	Other Likely Charter Trips
Nov 2009	7	2	14 (7)	132 (27)
Mar 2010	8	2	73 (22)	214 (28)
Jul 2010	16	2	113 (22)	351 (32)

The total number of trips from both registered vessels and likely charter vessels increased from winter to summer. Even though the number of fishing boats slightly increased, the larger number of trips in spring and summer was more a result of more fishing trips taken by each boat (Fig. 1). The observed trips per boat were significantly different among 3 months. July (Jul) was the highest and November (Nov) was the lowest (Fig. 1). The reported trips showed a similar pattern.

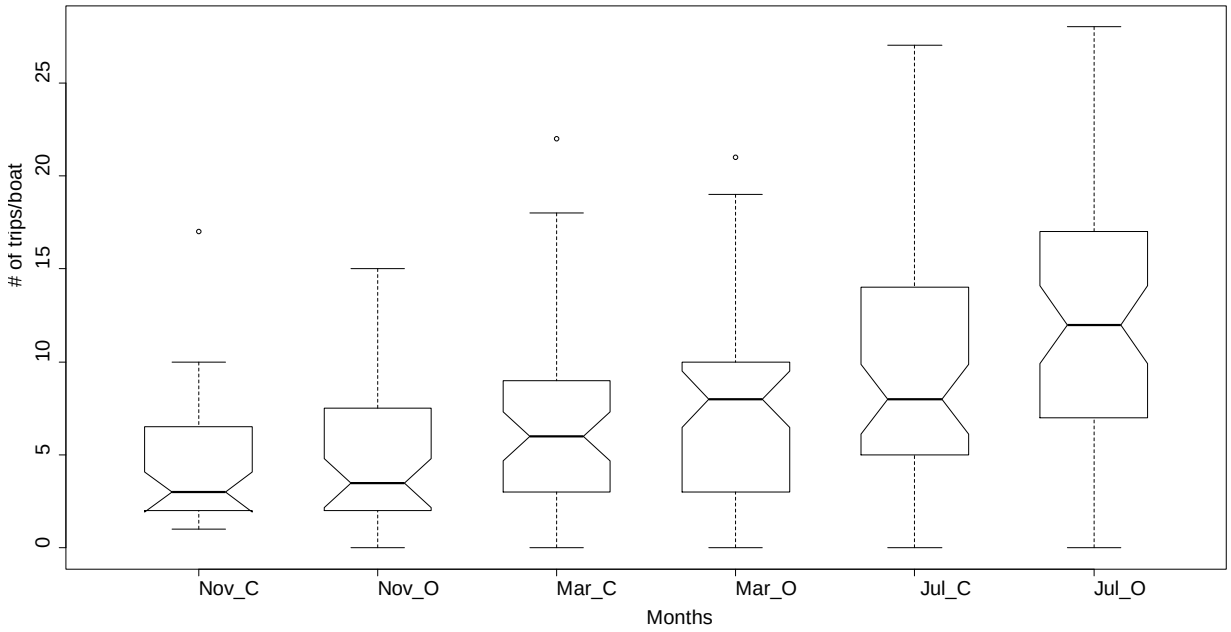


Figure 1.--Boxplots for the number of fishing trips (per boat) reported (Nov_C, Mar_C, and Jul_C) and observed (Nov_O, Mar_O, and Jul_O) from registered charter vessels. The horizontal bars within the boxes are the medians. Also shown in the boxplots are 25% and 75% quartiles (bottoms and tops of the boxes), fences (median ± 1.5*box length, or the smallest or the largest values in the data if they are less extreme) connected to the top or the bottom of a box by dashed lines), and outliers (empty circles outside the fences) (Hoaglin et al., 1983). The medians are significantly different ($\alpha = 5\%$) if the notches (above and below the medians, within the boxes in general) of medians in comparison do not overlap (Mathsoft, 1998).

Activity Surveys in Maui, Oahu, and Kauai

Fishing activities were monitored two times (November 2009 and July 2010) at Lahaina Harbor in Maui. In November, five registered charter vessels were shown in the November CML report. For one registered chartered vessel name in Maui there are a series of vessels associated with that name (for example, one boat name “Catch Fish” can have vessel series named “Catch Fish Again”, Catch Fish Too”, “Catch Fish Big”, etc.). All boats are involved in charter fishing. In the CML report, the charter trips were reported every day (30 trips) in November with one vessel name by one fisherman. Our survey indicated that all boats in the series were fishing in that month. The total fishing days were 88 based on the survey. Two other registered boats significantly underreported their trips (Table 6). Boat 5 reported all trips as nonchartered trips**.**

Table 6.--Lahaina Harbor (Maui). November 2009 survey results for the number of fishing days reported in CML monthly report (Days in CML) versus observed fishing trips (Observed Trips), observed fishing days (Observed days fished), and adjusted fishing days (Adjusted days fished).

Boat	Days in CML	Observed Trips	Observed Days Fished	Adjusted Days Fished	Report Rate
Boat 1	5	4	4	5	1.000
Boat 2	1	4	4	4	0.250
Boat 3	18	26	25	25	0.720
Boat 4	30	94	88	88	0.341
Boat 5	16	27	24	24	0.667
Sum	70	155	145	146	

Eight other likely charter vessels (based on charter boat listings at the Hawaii Fishing News website and advertisements at the harbor and online) each one made at least five fishing trips in November. They were not listed by current charter fishermen in their CML applications/ renewals. The total fishing days (with ≥ 4 people on board) was 78. Based on the CML system alone, these boats could not be identified as active charter boats for November 2009. There were no CML reports for fishing trips from these boats in November, and these boats were not checked as charter boats by fishermen who were current in November. One of these boats reported 2 charter trips in January 2009. These boats and their trips are indicated in Table 11 but are not included in Table 6.

In July 2010, five registered charter vessels reported fishing trips (Boats 1-5 in Table 7). One registered boat (NR1) did not submit a CML report but fished many days in July. Boat 5 has a series of vessels associated with one name. Six other charter boats were not shown on the CML charter list. They fished for 127 days (Table 11).

Table 7.--Lahaina Harbor (Maui). July 2010 survey results for number of fishing days reported in CML monthly report (Days in CML) versus observed fishing trips (Observed Trips), observed fishing days (Observed Days Dished), and adjusted fishing days (Adjusted Days Fished).

Boat	Days in CML	Observed Trips	Observed Days Fished	Adjusted Days Fished	Report Rate
Boat 1	0	1	1	1	0.000
Boat 2	26	32	27	27	0.963
Boat 3	21	24	24	24	0.875
Boat 4	26	29	27	27	0.963
Boat 5	31	221	147	147	0.211
NR1		35	27	27	
Sum	104	342	253	253	

The survey was only conducted once (November 2009) at Nawiliwili Harbor in Kauai. Six registered vessels reported charter trips. Two boats reported charter trips in CML report but they were not indicated as charter boats in the CML applications/renewals. Two registered charter boats underreported their trips (less than half of what was observed) (Table 8). One fisherman

reported two boats together (Boat 7) and CML showed two records on each day with different fishing areas. The reported numbers of trips were similar to the numbers observed from these two boats, but these two boats had trips on different days as observed by the surveyor.

Table 8.--Nawiliwili Harbor (Kauai), November 2009, survey results for number of fishing days reported in CML monthly report (Days in CML) vs. observed fishing trips (Observed Trips), observed fishing days (Observed Days Fished), and adjusted fishing days (Adjusted Days Fished) in the field at Nawiliwili Harbor (Kauai) in November 2009.

Boat	Days in CML	Observed Trips	Observed Days Fished	Adjusted Days Fished	Report Rate
Boat 1	1	0	0	1	1.000
Boat 2	7	7	7	7	1.000
Boat 3	2	3	3	3	0.667
Boat 4	3	9	9	9	0.333
Boat 5	4	6	5	5	0.800
Boat 6	5	18	18	18	0.278
Boat 7	12	11	11	12	1.000
Boat 8	2	3	3	3	0.667
Boat 9		1	1	1	
Boat 10		1	1	1	
Boat 11	0	2	2	2	0.000
Sum	36	61	60	62	

One registered boat filed a DNF report (Boat 11), but two fishing trips were observed in the field. Two registered boats (Boats 9 and 10) appeared at the site (once each) but they did not report their trips at Nawiliwili (they only reported their fishing trips at their home ports of Port Allen and Maalaea). There may have been two charter boats that were not in the current CML system as charter boats (included in Table 11 but not in Table 8). One boat reported in CML as a charter boat in January to April in 2009. That boat reported one nonchartered trip in November, but it was observed to take five trips (the number of people on board ≥ 4). The other boat had advertisement for charter fishing on site and had 12 fishing trips (number of people on board ≥ 4). There was no reporting for that boat in the November CML report.

One survey was carried out at Kewalo Basin Harbor (Oahu) in November 2009. Nine charter boats reported their trips at the harbor. Two of them significantly under reported the trips (Table 9). One captain reported trips from two boats under a name combination (Boat 4). One of these two boats took multiple trips on some days, but only one trip was reported each day. All trips from Boat 4 were reported as nonchartered trips**.** Two registered vessels (Boats 10 and 12) submitted DNF reports, but fishing trips were observed in the field. One boat (Boat 11) showed nine trips at Kewalo Basin, but all these trips were reported as chartered trips at a different port. The fisherman associated with Boat 14 did not submit CML reports for November and showed nine daily trips for the month as observed by the surveyor. One unregistered vessel (not in the November CML report and not in Table 9) also likely had some charter trips (three trips with the number of people on board ≥ 4, Table 11).

Table 9.--Kewalo Basin Harbor (Oahu). November 2009 survey results for number of fishing days reported in CML monthly report (Days in CML) vs. observed fishing trips (Observed Trips), observed fishing days (Observed Days Fished), and adjusted fishing days (Adjusted Days Fished).

Boat	Days in CML	Observed Trips	Observed Days Fished	Adjusted Days Fished	Report Rate
Boat 1	10	14	14	14	0.714
Boat 2	15	12	12	15	1.000
Boat 3	3			3	1.000
Boat 4	16	36	31	31	0.516
Boat 5	17	11	11	17	1.000
Boat 6	2	1	1	2	1.000
Boat 7	3	2	2	3	1.000
Boat 8	1	1	1	1	1.000
Boat 9	2	8	8	8	0.250
Boat 10	0	3	3	3	0.000
Boat 11		9	9	9	
Boat 12	0	2	2	2	0.000
Boat 13	5	4	4	5	1.000
Boat 14		9	9	9	
Sum	74	112	107	122	

The trips reported and observed at Lahaina Harbor, Nawiliwili Harbor, and Kewalo Basin Harbor are summarized in Tables 10 and 11. The report rate for all registered boats at each harbor range from 48% to 66% in November 2009 (last column in Table 10). Considering the fact that there were a significant number of other likely charter trips (Table 11), the actual report rate could be even lower. The trip counts from the likely charter boats in Table 11 (last column) only included fishing trips with ≥ 4 people on board. In Lahaina, there were more fishing trips observed and reported in July than in November. In July, more multiple trips were taken by some boats within a day. The number of trips from unregistered charter boats was larger than the reported trips in Lahaina (Tables 10 and 11).

Table 10.--Summary for trips for registered charter vessels at the other three harbors surveyed in November 2009 including observed trips from boats that did not submit reports or submitted DNF (Did Not Fish) reports. Lahaina Harbor was also surveyed in July 2010. The numbers in the parentheses are number of boats.

Harbor	Days in CML	Adjusted Days Fished	Boats with Report Rate > 80%	Trips from No Reporting or DNF	Report Rate for the Harbor
Lahaina—Nov	70 (5)	146 (5)	1		0.479 (5)
Lahaina—Jul	104 (5)	226 (5)	3	27 (1)	0.411 (6)
Nawiliwili	36 (8)	58 (8)	4	4 (3)	0.600* (9)
Kewalo	74 (10)	99 (10)	7	23 (4)	0.655* (13)

*The boats that reported all charter trips at different harbors (their home ports) were excluded for the report rate calculation. At Nawiliwili Harbor and Kewalo Basin Harbor, the number of boats included for the report rate estimation is less than the total number of boats.

Table 11.--Summary of other trip information at the other three harbors surveyed in November 2009 including second trips taken within a day and other likely charter trips observed by the surveyors. Lahaina Harbor was also surveyed in July 2010.The numbers in the parentheses are the number of boats.

Harbor	Late reports	Name with multiple boats	Second trips (boats)	Other likely charter trips
Lahaina—Nov	1	2	9 (4)	78 (8)
Lahaina—Jul		2	89 (10)	127 (6)
Nawiliwili		1	1 (1)	16 (2)
Kewalo		1	6 (2)	3 (1)

In November 2009, 431 trips were recorded in the CML reports from 69 charter boat names at the 4 harbors surveyed. For these 69 boats that reported non-zero fishing trips, the observed trips by surveyors were 613 (70.3% of the observed trips were reported in CML reports). Forty-two of these 69 boats reported > 80% of their observed trips. Sixty-six trips were observed from 11 charter boats that submitted DNF reports or did not submit any trip reports at the 4 harbors. The report rate for all registered charter boats was 63.5%. The number of observed trips from likely charter boats (38 vessels) was 229. Including the likely charter trips, the reported trips only accounted for 47.5% of the observed trips.

Comparison of Catch between Fish Reports (charter desk) and CML Reports

Billfish, including blue marlin, is one of the major species groups targeted by charter fishermen in Hawaii. Catch and release (number and weight) for blue marlin, striped marlin, and spearfish are recorded by the charter desk at Honokohau for boats that use the harbor weigh station. The tables in Appendix C include catch and release for boats that reported charter trips in 2009 CML reports. The catch and release in the tables include these from chartered and nonchartered trips (these two types of trips cannot be separated in the charter desk report).

The overall report rate of blue marlin catch (kept) was 68.1% (184/270) and the rate for release was 89.2% (949/1064) at Honokohau in 2009. These rates were higher than average for individual report rates from each boat (Table C1). The number of released blue marlin was much higher than the kept blue marlin and the reported rate for release was also higher. Average blue marlin weight in charter desk fish reports is 306.1 lbs and the average weight from the CML report is 279.4 lbs (Table C2).

The numbers released and kept were much lower for striped marlin than for blue marlin (Table C3). The overall report rate for catch was 61.0% (36/59) and the rate for release was 78.2% (61/78). The average weight from charter desk fish reports is 74.5 lbs and the average from the CML report is 64.5 lbs (Table C4).

The numbers kept and released for spearfish were lower than for blue marlin, but higher than for striped marlin (Table C5). The report rate for catch was 66.7% (102/153) and the report rate for released spearfish was 75.6% (93/123). The average weight of spearfish from charter desk fish

reports was 34.3 and the average reported from CML was 33.5, lowest among the three billfishes (Table C6).

The catch report rates for kept billfish at Honokohau Harbor (61.0%-68.1%) were similar to the trip report rate at the harbor (68.9% in November 2009). In July 2010, the surveyor at Lahaina Harbor also tried to obtain the catch data while monitoring fishing activity. Surveying and monitoring to estimate or validate catch are more challenging than validating charter trips whereas the logs and records from charter desk or other harbor offices can be used for catch validation and estimation, especially for billfish. Lahaina Harbor is smaller than Honokohau Harbor and it was possible to obtain catch information for most boats in the harbor. One of surveyors there was able to talk to the captains or charter booth staffs to obtain catch information during his survey in July 2011. The report rate for billfish catch was not as low as the report rate for the fishing trips. In the report for the boat name with multiple boats, the catch reported included catch from multiple boats. For all five boat names/fishermen that reported in CML, all billfish observed by the surveyor were included in the CML reports while the trip report rate was only 46% for these five boat names (Tables 7 and 10).

Comparison of Catch Rate from 2003 to 2005 HMRFS For-Hire Survey and CML Report

HMRFS included charter boats in 2003-2006. The onsite intercept data were relatively complete for several harbors, including Honokohau Harbor, Lahaina Harbor, Maalaea Harbor, and Nawiliwili Harbor. Data for registered charter boats from these harbors in 2003-2006 CML reports were also compiled. Figure 2 displays the data from Honokohau Harbor (see Appendix D figures for data at other sites). According to CML data, the general catch rate (and seasonal variations) for individual species were consistent across different years at Honokohau, Lahaina Harbor, and Maalaea Harbor. At Nawiliwili Harbor, the catch rate for yellowfin tuna and skipjack were higher in 2005 than in 2006 (Fig. D3). The catch rates for some species varied among the different harbors. The catch rate for blue marlin and shortbill spearfish was higher at Honokohau Harbor than at the other three sites. The catch rate for mahimahi at Honokohau Harbor was lower than that at the other three sites. The catch rate for yellowfin tuna was low at two Maui harbors (Fig. D1 and Fig. D2). Nawiliwili Harbor showed high catch rates for skipjack and yellowfin tuna. In addition to the comparisons among harbors, some species also showed different seasonal variations. The catch rate for blue marlin was higher in the summer and the catch rate for shortbill spearfish was highest in the first survey period (wave) (January-February) (Fig. 2). The catch rate for mahimahi was lower in the summer (waves 3 and 4).

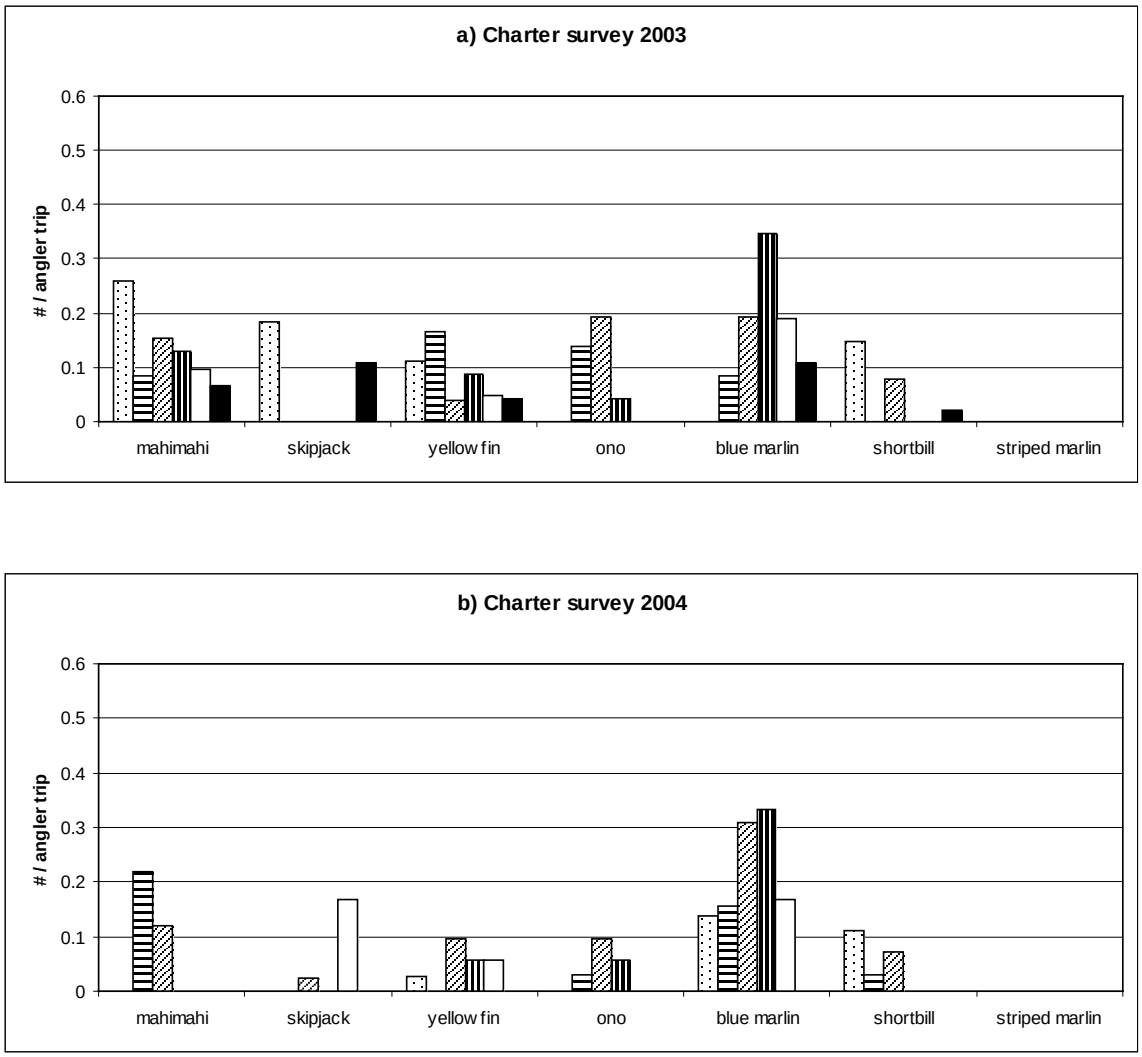
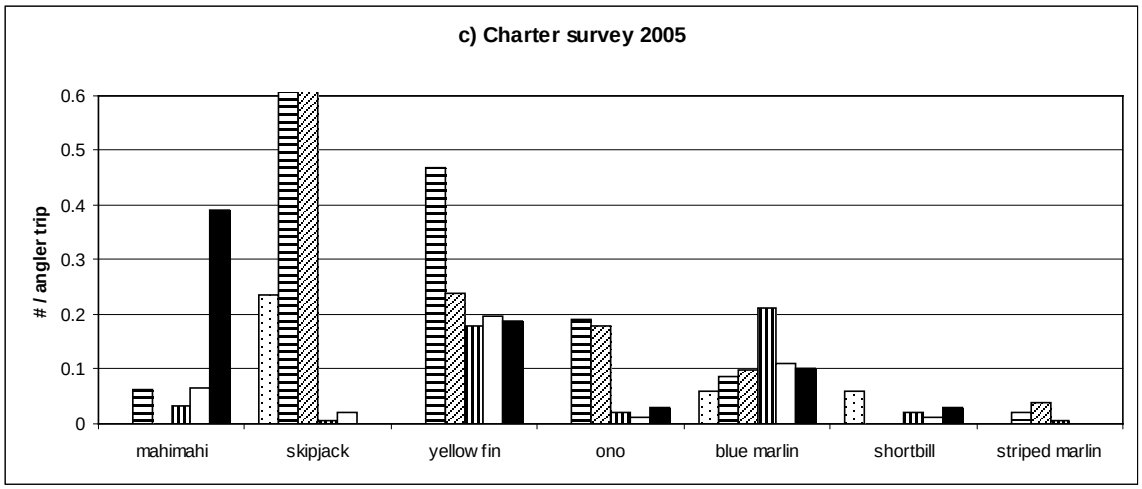
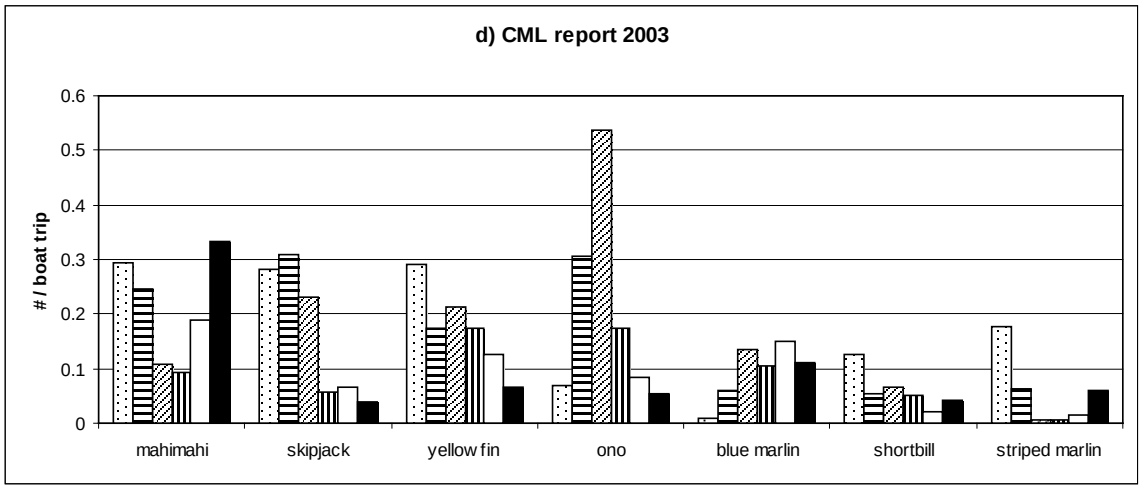


Figure 2.--Catch rate estimates from the HMRFS for-hire survey (a-c, # of fish per angler trip) and the CML monthly report (d-f, # of fish per boat trip) at Honokohau Harbor for six waves in 2003-2005. One wave is for a 2-month period. Dotted bars are for wave 1, hatched bars are for waves 2-4, blank bars for wave 5 and filled bars for wave 6.





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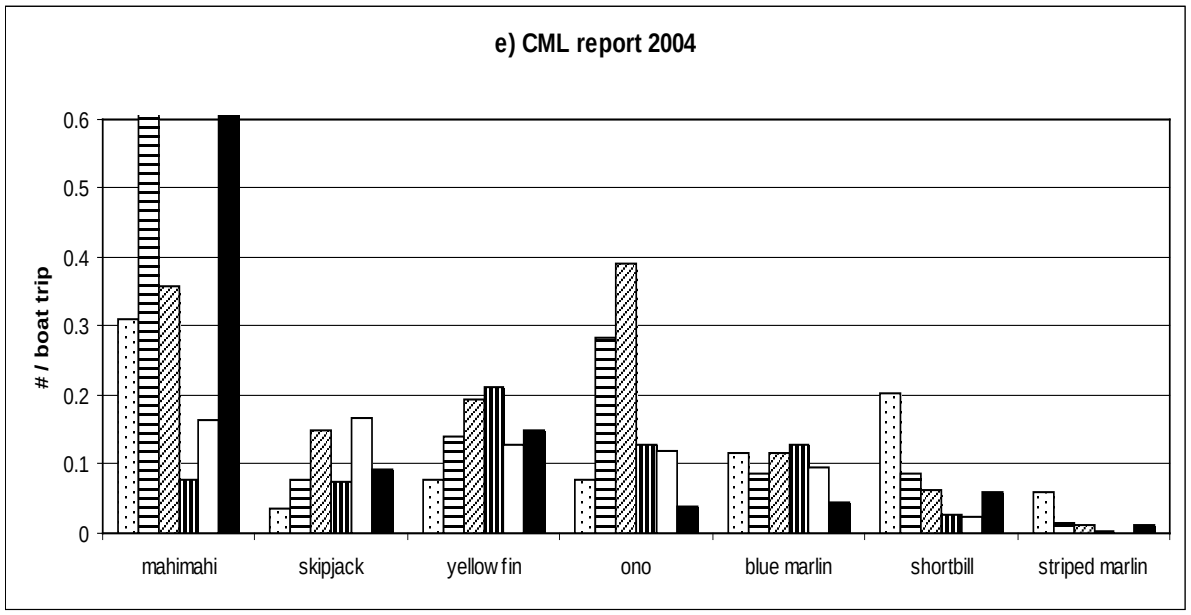

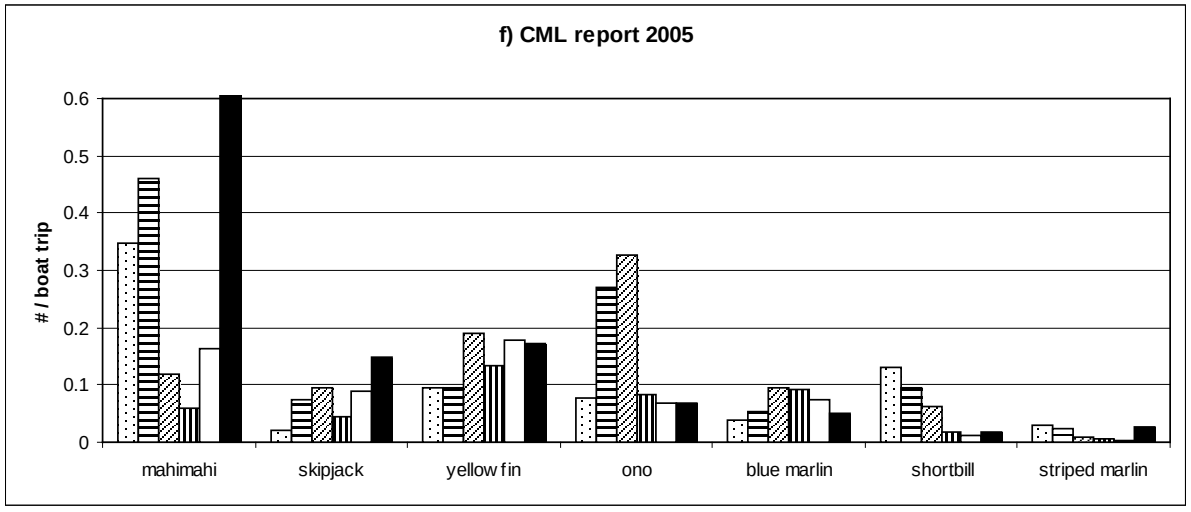

Figure 2 (continued)

The comparisons between catch rates from the CML monthly report and from HMRFS surveys in 2003-2006 (shown in Fig. 2 and Fig. D1-3) are summarized in Tables 12 and 13. Correlation analyses (correlation coefficient and P value) and regression analyses (regression through origin) were made with catch rate from CML report as independent variable and catch rate from the survey report as dependent variable for regression (Table 12). We also calculated a ratio of catch rates as the sum of catch rates from each wave in 2003-2006 HMRFS survey divided by the sum in catch rates from each wave in 2003-2005 CML reports (Table 13). This ratio is the same as the ratio of average wave catch rates. At Honokohau Harbor, rates from two sources were tightly related for mahimahi, ono, blue marlin, and shortbill spearfish (i.e., the P values for the correlation are close to or less than 0.05). For blue marlin, the rate from the survey (number of

fish per angler trip) was larger than rate from CML (number of fish per boat trip) according to regression and ratio estimates (highlighted values in Tables 12 and 13). At Lahaina Harbor, the two rates were tightly related for mahimahi, ono, and striped marlin. The rate from the survey was larger than from CML report for yellowfin tuna. At Maalaea, the two rates were closely related for mahimahi, skipjack, ono, blue marlin, and shortbill spearfish. The rates were larger from survey for yellowfin tuna. At Nawiliwili, the two rates were tightly related for mahimahi, yellowfin tuna, ono, and blue marlin.

According to the HMRFS for-hire survey in 2003-2006, the average number of patrons per boat trip in Honokohau Harbor, Lahaina Harbor, Maalaea Harbor, and Nawiliwili Harbor were 2.9, 4.5, 5.3, and 4.6. The ratios for the two catch rate estimates (number of fish / angler trip from the HMRFS for-hire survey vs. number of fish / boat trip from CML reports) would be 0.34 (1/2.9), 0.22 (1/4.5), 0.19 (1/5.3), and 0.22 (1/4.6) for these harbors if these two methods were directly comparable. The ratios for different species at Nawiliwili Harbor were close to 0.22 (Table 13). At other harbors, the ratios for most species were higher than predicted, especially for blue marlin at Honokohau Harbor and yellowfin tuna at two harbors in Maui.

Table 12.--The correlation between catch rates from CML reports and HMRFS for-hire survey in 2003-2006 (catch rates shown in Fig. 2 and Fig. D1-3) using data aggregated by survey wave within each harbor. R = correlation coefficient, P = probability of correlation coefficient R being zero, S = slope from regression through origin for survey catch rates versus the rates from CML reports, R^2= R squared value in regression through origin, percentage of variance explained by regression, N = number of waves by harbor for the analyses.. Species Mahi = mahimahi, Skip = skipjack tuna, Yellow = yellowfin tuna, Blue = blue marlin, Short = shortbill spearfish, Striped = striped marlin. The numbers for slope are highlighted when they are greater than 1, signifying higher catch rate estimation from the survey.

Site		**Mahi**	**Skip**	**Yellow**	**Ono**	**Blue**	**Short**	**Striped**
Honokohau (Hawaii, N=18)	R (P)	0.45 (0.06)	-0.12 (0.65)	0.02 (0.94)	0.85 (0.00)	0.73 (0.00)	0.70 (0.00)	-0.15 (0.55)
	S (R^2)	0.27 (0.54)	0.72 (0.08)	0.64 (0.45)	0.36 (0.81)	**1.76** (0.85)	0.54 (0.66)	0.02 (0.01)
Lahaina (Maui, N=18)	R (P)	0.82 (0.00)	0.04 (0.86)	-0.03 (0.90)	0.58 (0.01)	0.02 (0.94)	0.25 (0.32)	0.51 (0.03)
	S (R^2)	0.43 (0.95)	0.33 (0.31)	**1.44** (0.12)	0.39 (0.65)	0.75 (0.36)	0.46 (0.35)	0.29 (0.45)
Maalaea (Maui, N=24)	R (P)	0.60 (0.00)	0.44 (0.03)	0.15 (0.49)	0.40 (0.06)	0.49 (0.02)	0.71 (0.00)	0.31 (0.15)
	S (R^2)	0.28 (0.69)	0.33 (0.41)	**1.03** (0.13)	0.21 (0.48)	0.58 (0.39)	0.72 (0.65)	0.21 (0.19)
Nawiliwili (Kauai, N=12)	R (P)	0.80 (0.00)	0.48 (0.11)	0.78 (0.00)	0.70 (0.01)	0.88 (0.00)	0.04 (0.91)	
	S (R^2)	0.25 (0.75)	0.20 (0.62)	0.33 (0.78)	0.26 (0.76)	0.39 (0.78)	0.08 (0.03)	

Table 13.--The ratio of catch rate (fish per angler trip) from HMRFS survey to the catch rate (fish per boat trip) from CML reports. The ratio is the sum of HMRFS survey catch rates from each wave in 2003-2006 divided by the sum of catch rates from corresponding waves in CML reports.

Site	Mahi	Skip	Yellow	Ono	Blue	Short	Striped
Honokohau (Hawaii)	0.30	**1.33**	0.71	0.31	**1.72**	0.50	0.13
Lahaina (Maui)	0.44	0.46	**3.52**	0.40	0.90	0.69	0.32
Maalaea (Maui)	0.29	0.36	**3.02**	0.27	0.60	0.80	0.24
Nawiliwili (Kauai)	0.22	0.24	0.44	0.25	0.29	0.23	

DISCUSSION AND RECOMMENDATIONS

Boats That Were Not Registered by Fishermen as Intended for Charter Fishing

When fishermen apply or renew their CML, on the form there is an entry for charter (Y/N) under the vessel information. In addition, there is an entry on the monthly CML report asking whether it was a charter trip. However, significant numbers of likely charter fishing vessels were not indicated by fishermen in their license application/renewal or in their fishing reports as charter boats at Honokohau Harbor and Lahaina Harbor (Tables 5 and 11). It is unknown if the operators of these charter boats (not on the charter boat list extracted from CML license and monthly report) have CML licenses. For some charter trips reported in the monthly report, the boats associated with these trips were not found in the charter boat list from active license application/renewal. *Via outreach, fishermen with licenses should be asked to include their charter boat information in the application and renewal forms and to indicate their charter trips as chartered in their monthly reports. One complication is that the fisherman can only put one boat name in the CML application/renewal and can only put one vessel name in one fishing report. Some fishermen (owners or major captains of some charter corporations) may own/operate multiple boats. It is recommended that such fishermen submit separate reports for each boat that they use in the month.*

Small boats in Hawaii can register with the Division of Boating and Ocean Recreation. The U.S. Coast Guard licenses boats > 5 tons and inspects commercial fishing vessels for safety requirements. Commercial boats, including charter boats in Hawaii, are required to comply with national safety standards. The safety equipment is expensive and may take up substantial space onboard (leaving less space for patrons for charter boats). Some of standards are designed for the northwest region and may be too restrictive for Hawaii. The restrictive safety requirement (when enforced) reduced the number of boats registered for charter fishing (HDAR, pers. comm.).

According to an estimate from HDAR staff, ~ 40% of the charter boats in Hawaii were not licensed for commercial operation and were not reporting charter trips. The November 2009 survey indicated that > 80 active charter vessels (as of November 2009) at the four harbors could be identified with the CML registration and reporting system. Thirty-eight likely charter vessels (with 229 trips) could not be affirmed as charter boats with the CML reporting system and were not shown in the CML monthly reports (Tables 5 and 11).

Compliance in CML Reporting

Information on reporting incompliance is provided in Tables 4, 5, 10, and 11. In Honokohau Harbor, 15% –28% of the CML reports that reported taking trips were submitted late. The percentage was higher in the summer (Table 5). The observed trips from boats that submitted DNF reports (or did not submit any reports) were 17% to 20% of reported trips (Table 4). In Lahaina Harbor, one out of five reports was submitted late in November 2009 (Table 11). Fishing trips were also observed at Lahaina Harbor, Nawiliwili Harbor, and Kewalo Basin Harbor from boats that did not submit CML reports or submitted DNF reports. These trips accounted for 26% (Lahaina in July 2010), 6% (Nawiliwili), and 19% (Kewalo Basin) of total trips reported (Table 10). In May 2009, Department of Land and Natural Resources launched the Civil Resources Violation System (CRVS). For a late report, the first offense allows for fines up to $15 if the fine is paid within 21 days after the fisherman has received the notice. According to HDAR, this system improved compliance significantly. The results from the study would reflect the improved compliance in report submission after the CRVS was in place.

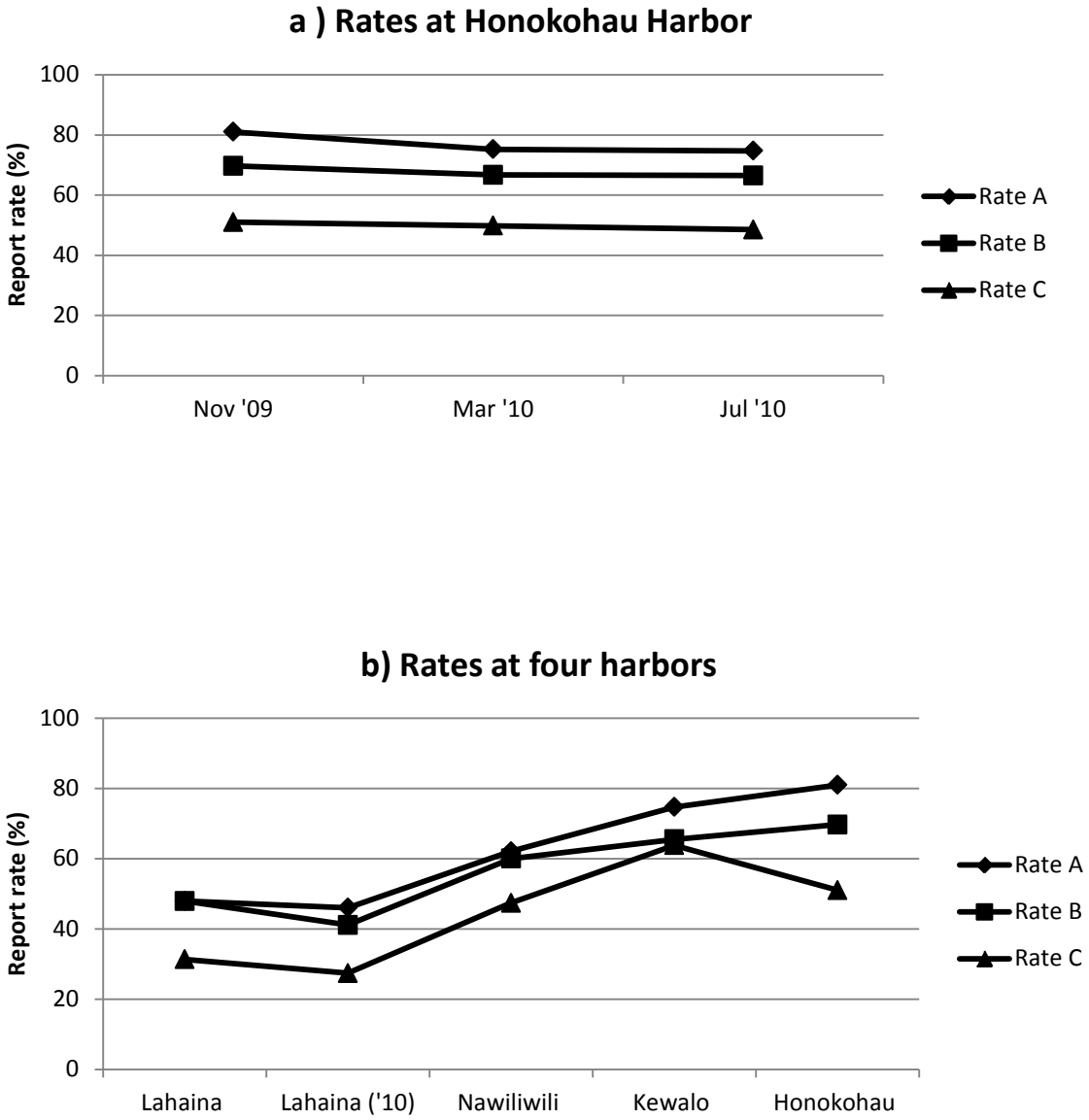

Figure 3.--Report rates at Honokohau Harbor in three different months (a) and all four harbors in November 2009 including additional data in July 2010 for Lahaina Harbor (b). Rate A is the report rate for boats that reported taking fishing trips, Rate B is for all registered boats at the harbor (including registered boats that submitted DNF reports or did not submit any reports at all), and Rate C is for all charter boats (including likely charter boats at the harbor).

For boats that reported taking fishing trips, the report rates for trips ranged from 75% to 81% in Honokohau and rates were lower in March and July than in November (Rate A in Fig. 3). The report rates (for boats that reported taking trips) were 62% at Nawiliwili Harbor and 75% at Kewalo Basin Harbor. The rates were 48% in November and 46% in July at Lahaina Harbor. The low report rate at Lahaina Harbor was based on multiple boats observed in the field for one boat name shown in CML (Boat 4 in Table 6 and Boat 5 in Table 7). In Lahaina Harbor, there was a name combination for two boats (Boat 3 in Table 6 and Boat 4 in Table 7). In Honokohau Harbor, two boat names (Tables 1-3) are also name combinations. The reports for one of the two included trips from multiple boats under that name. There was also one name combination at Kewalo Basin and one at Nawiliwili. The name combination at Kewalo Basin (Boat 4 in Table 9) only reported half of the trips observed in the field. All trips reported from each of these name combinations (at all four harbors) were reported under one fisherman/captain/owner for each name combination in the month of November. Time overlaps were observed for some boats under one name (or name combination) in the field. It appears that some captains or owners of some charter fishing corporations (with multiple boats) might report trips for boats that they were not on physically. It is apparent that some operators did not report the charter trips. *HDAR may ask the operators who are on the vessel to report the charter trips themselves (rather than the corporate owners or other captains who are not on the vessel) and advise the operators without a CML to obtain their own licenses. When boat owners or captains report for boats on which they do not fish, they may neglect to report trips without catch. HDAR may also ask fishermen to avoid using boat name combinations (or using one boat name for multiple boats) in the reports, especially when more than one boat goes out on the same days.*

Three kinds of report rates were presented for four harbors in Figure 3. Rate A estimates were calculated based only on the boats that were reported taking fishing trips. Rate B estimates (in Tables 4 and 10) also included the confirmed charter boats that associated with DNF report or no reports (NR). The pessimistic estimates (Rate C) included both confirmed charter boats and other likely charter boats (Tables 5 and 11). For boats with more CML fishing days than fishing days observed, the adjusted fishing days (CML fishing days) were used for report rate calculation (see Methods) assuming that these boats actually took the number of trips reported. This method would assume that the "extra" trips (CML days minus fishing days observed) was purely a result of the lapse in the survey or misreporting for trips taken by the boat at a different harbor. The surveyors monitored fishing trips during 8:00 to 17:00 every day in the month surveyed. The surveyors could have missed some actual trips. The survey results in 2009 and 2010 also indicated that some of the trips observed at the surveyed harbors were reported at other harbors. It is likely that some trips reported at the surveyed harbors were taken at other harbors.

However, some of the difference (CML days minus observed fishing days) could also be based on the fact that some of trips were reported for other charter boats if the fishermen operated on multiple boats in the month (even though special attention was paid to the boat name combination or single name known for multiple vessels). Based on the results in November 2009, there was one-to-one match between charter boats and charter fishermen in the CML reports (i.e., one boat was reported by one fisherman only and one fisherman only reported for one boat for the month). It is likely that once a boat was reported by a fisherman, other fishermen would not report trips for that boat. Another way to calculate Rate B and Rate C is to use observed fishing days (rather than adjusted days fished) assuming that all the "extra" trips (CML

days minus fishing days observed) were for trips taken by other vessels (especially the likely charter boats or DNF/NR boats). The report rates for Lahaina Harbor and Nawiliwili Harbor would change very slightly (the sum of observed days is very similar to the sum of adjusted days, see Tables 6-8) under this alternative assumption. The alternative report Rate B estimates for Honokohau Harbor (slight changes) would be 76% (November 2009), 73% (March 2010), and 71% (July 2010), and report Rate C would be 54%, 53%, and 51%. The report Rate B would be 76% and report Rate C 73% for Kewalo Basin Harbor (~ 10% higher).

Difficulties in Comparing Individual Trips and Validating Fishing Hours

Some boats were observed to make second trips in a day, especially in March and July 2010 (Tables 5 and 11). For observations from the field survey, the observed trips were converted to days fished before they were compared with what was reported in CML report. For one boat name (for multiple boats, Tables 1-3) in Honokohau Harbor, we were able to identify trips in the CML reports from different boats within a day, with the help of observed trip records. Without field data, it would be impossible to tell whether fishermen reported different entries within a day for multiple trips from one boat or for trips of multiple boats.

It is challenging to compare individual trips (such as the trip durations) from field surveys and CML reports. First of all, for many boats the total numbers of trips in the month were not equal based on two sources. Even for boats with similar trip numbers from both sources, their dates may not match. For instance, 14 (out of 45) boats at Honokohau Harbor in November (2009) had the same number of trips reported and observed (Table 1). Among 37 trip days from these boats, 15 trip days did not match in date. In March and July 2010, when each boat took more trips, fewer boats (8 out of > 50 each month) had the same amount of trips both in the CML reports and from monitoring. However, for these boats with matching trip numbers, the mismatched dates were lower (4 out 43 trips in March and 2 out of 164 trips in July). It is possible that some fishermen may depend more on the boat log than on their memory for CML reporting when more trips are taken in a month. *One of the advantages of our survey design was to collect "complete" data for a whole month rather than selecting random dates to survey fishing activities. To survey at randomly selected dates may underestimate reporting rates when fishermen report the trips not with the exact dates that they fish.* The number of fishing hours (fishing gear soak time) reported in CML is hard to evaluate. In many cases, fishermen reported the same fishing hours for all trips within the month or even for trips when multiple boats under one name/name combination were out on the same day. In the field survey, different durations (return time – departure time) could be used as an estimate for fishing hours. However, many of the field observations missed a departure or return time of the trip (and travel time to and from the fishing site can vary on different days). *It is possible more frequent (e.g., weekly) reporting may improve the records for individual trips. However, more frequent reports for the charter sector will increase the administrative workload for HDAR and increase the reporting burden for charter fishermen.*

Report Rates for Catch and Release and Estimates of Catch Rates

The report rates for billfish catch in 2009 at Honokohau Harbor ranged from 61% to 68% and the report rates for billfish released were higher, ranging from 75% to 89% (Appendix C tables). The report rates for fishermen/boats that reported their catch/release to the charter desk were biased toward trips with "significant" catch/release. It is unknown whether report rates are similar between trips/boats with significant catch/release and trips/boats without significant catch/release. Future investigation is also needed to see if the report rates for other fish groups (nonbillfish groups) are similar to the estimates from this project. The surveyors at Lahaina Harbor also recorded catch while monitoring fishing trips. Lahaina Harbor is relatively small, and retained catch from boats can be observed without much movement by the surveyors. The CML report rate for billfish catch was much better than the report rate for fishing trips at Lahaina Harbor. In the report for the boat name with multiple boats, the catch reported combined catch from multiple boats based on the billfish catch observed by the surveyor. Trips from all boats under that boat name were much underreported (only one trip was reported each day while multiple boats were fishing on the same days for many days). Catch rate estimates would be inflated if such data were used. *Charter fishermen may be informed that accurate reporting for trip number is important too. Adequate trip reports would better reflect the economic value of the charter sector in Hawaii and would allow better estimates for catch rates.*

The CML data in 2003-2006 indicated that at most harbors the catch rate and seasonal variations for major fish species were consistent among different years. However, different harbors showed different catch rates for some species. For instance, catch rate for blue marlin and shortbill spearfish was highest at Honokohau Harbor but the rate for mahimahi was lower than at other harbors. *Thus, all major harbors need to be covered in a survey trying to estimate catch rate for different species and season combinations.*

For many species, the catch rate estimates from the two methods (the for-hire survey in 2003-2006 and the CML monthly report) showed significant correlation (Table 12). The rate estimates in number/boat trip (from CML monthly reports) should be higher than the rate estimates in number/angler trip (from the HMRFS for-hire survey) by some factors (i.e., average number of patrons per boat). The higher catch rates for blue marlin from the for-hire survey at Honokohau than from the CML estimates were an indication of inconsistency and probably resulted from bias in the intercepts collected by surveyors. The for-hire survey site at Honokohau was located near the weigh station in the harbor. The boats interviewed were likely to be boats with higher catch rate for blue marlin. The boats stopping by the weigh station to have the catch weighed were more likely to have blue marlin in their catch. It is not clear why catch rates for yellowfin tuna at two Maui harbors were higher from the for-hire survey than from the CML reports, but bias in sample selection is a likely explanation. Underreporting for small yellowfin tuna in CML reports is also possible because they might not contribute much to the catch weight and could be neglected in the reports.

Synthesis of Trip Report Rates and Billfish Catch

According to the CML reports in 2007-2009, the charter boat fishing trips from four surveyed harbors (7645 in 2007, 7013 in 2008, and 5821 in 2009) accounted for 68%-73% of the total reported charter fishing trips in the state. Honokohau harbor is the biggest charter boat harbor in the state and is most active in summer months (Fig. 4). This pattern is not clear at the other three harbors. The survey continued in March and July 2010 at Honokohau Harbor in an attempt to characterize the reporting rate during a season when fishing activity was different. For Honokohau Harbor and Lahaina Harbor where fishing activity was also monitored in July 2010, more reports were submitted late for July (Tables 5 and 11). The report rates were similar among seasons within a harbor but different among harbors (Fig. 3). The overall report rate (Rate C in Fig. 3) in Honokohau was consistent (~ 50%) in 3 months (seasons). The overall report rate in Lahaina was lower (~ 30%) as a result of the high proportion of charter boats not shown in the Hawaii CML system. If the overall report rates at Nawiliwili Harbor (47% in November 2009) and Kewalo Basin Harbor (64% in November 2009) did not vary much among seasons, the charter trips from these four major charter harbors might be underreported in the CML report by approximately 50% in 2009 and 2010. *Based on the data from the four harbors in November 2009, the report rate for all registered charter boats was 64% (or 68% under a different assumption) and the report rate for all charter boats (including likely charter boats) was 48% (or 50%). Such proportions may be applied to the reported trips in CML reports to adjust underreporting and non-reporting for charter trips. It is unclear what the report rates might have been before the Civil Resources Violation System (CRVS) went into effect (in May 2009). Repeated survey/monitoring will be needed especially when there are changes in report requirements and report management policies.*

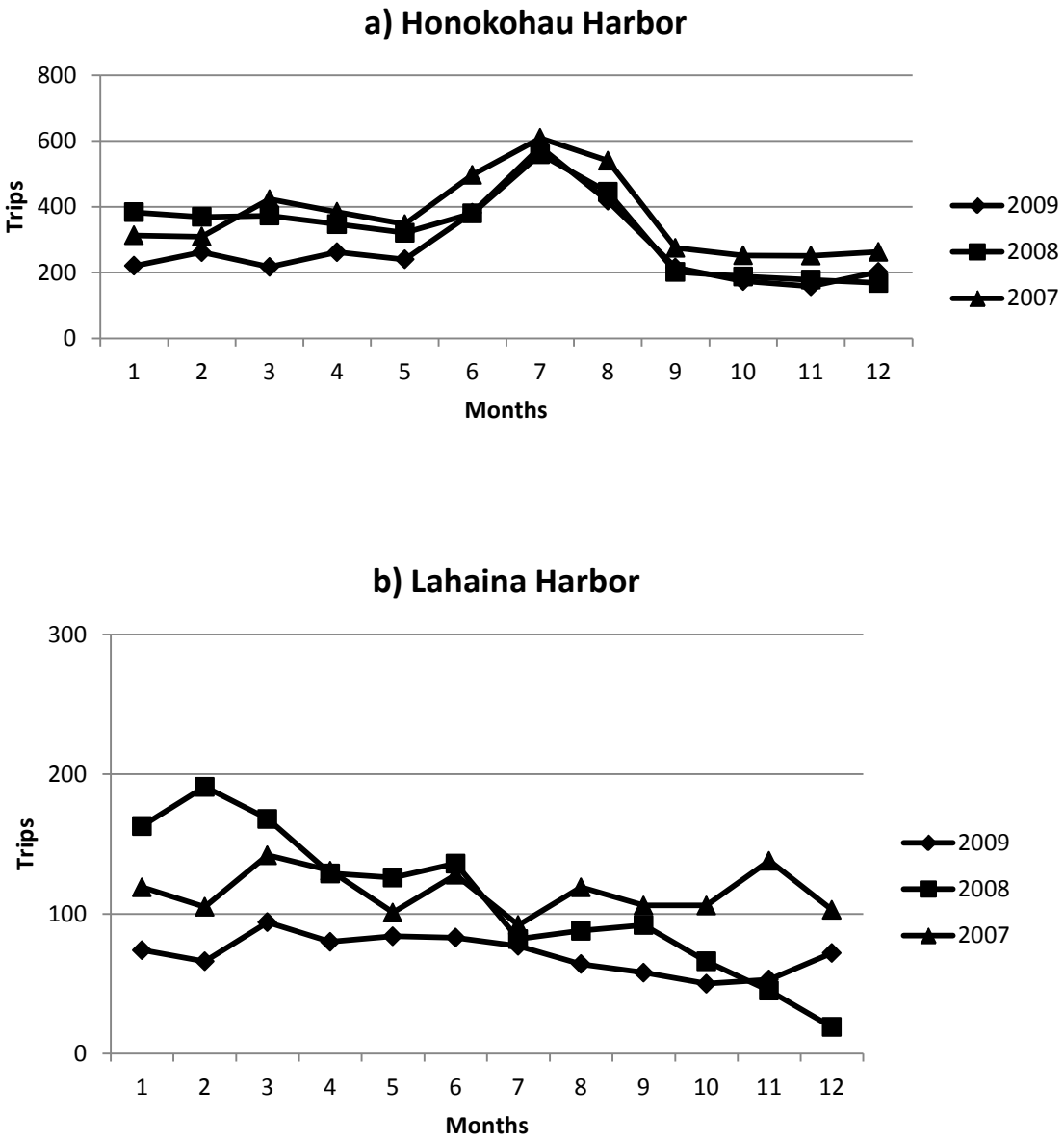

Figure 4.--Charter boat monthly trips at a) Honokohau Harbor (Hawaii, or Big Island), and b) Lahaina Harbor (Maui) from 2007-2009 commercial marine license catch reports.

The common species (based on catch weight) that were recorded in CML reports from charter fishing include yellowfin tuna, mahimahi, blue marlin, wahoo, skipjack tuna, striped marlin, bigeye tuna, and shortbill spearfish. Among these common species, the catches for blue marlin, shortbill spearfish, and striped marlin were more than 10% of catch weight estimates for the same species in 2007 HMRFS (including catch estimates from shoreline and private boat fishing). The only catch for blue marlin from charter fishing was > 10% of the commercial landing estimates, based on 2007 data (Hamm et al., 2009). Thus, billfishes are important components for charter fishing catch in Hawaii. According to the catch data from 2009 CML reports, the surveyed four harbors contributed more than 68% for kept catch and more than 80%

for released billfish, with Honokohau Harbor playing the most important role (Table 14). In this report, the data from the charter desk at Honokohau Harbor were used for estimating the report rate for billfish catch. *The total catch from the charter desk fish report should be explored and may be used to estimate and validate total billfish catch, at least for Honokohau Harbor. For other major charter boat harbors, there may be records for billfish catch as well. For example, the author of Maui Seawatch for Hawaii Fishing News magazine keeps historic logs for significant catch from charter boats at Lahaina Harbor.*

Table 14.--Billfish catch (number of fish) from 2009 CML reports for charter fishing at four surveyed harbors.

Harbor	**Fishing trips**	**Blue marlin**		**Striped marlin**		**Spearfish**	
		Kept	Release	Kept	Release	Kept	Release
Honokohau	3332	213	907	47	62	115	101
Lahaina	855	35	22	10	3	6	4
Nawiliwili	620	20	3	1	0	5	0
Kewalo	1014	118	11	30	1	32	2
Sum of 4 harbors	5821	386	943	88	66	158	107
Total (for state)	8591	519	1029	129	80	174	117
Ratio of 4 harbors to state total	0.68	0.74	0.92	0.68	0.83	0.91	0.91

CONCLUSIONS

Based on the data in November 2009 at four monitored harbors, fishing trips recorded by charter boats in the CML general fishing reports (submitted monthly) underestimated the trips by 32% to 36% due to underreporting and nonreporting for charter boats in the CML system. Many charter boats were not on the CML charter list. Some of these charter boats were excluded because only one vessel name (or name combination) can be put in one CML application and in one page of the CML report. Some owners or captains may fish on multiple boats. *To include more charter boats in the CML reporting system, the CML application and renewal should be modified so that multiple vessel names can be included in one form. Owners and captains who use multiple vessels can be asked to submit separate reports for each boat used. To improve the report rate for the charter boats on the charter list, outreach is needed to show that reporting all trips (including zero catch trips) is as important as reporting catch.*

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APPENDICES

Appendix A: Survey Forms Used in the Survey

Hawaii Boat Activity Survey

Surveyor Name _____ Date _____
Start Time _____ Port Name _____
End Time _____

Survey No.	Boat Name	Boat No.	BF Boat (Y/N)	Charter (Y/N/U)	Fishing (Y/N/U)	# of People	Activity	Depart Time	Return Time	Remarks
Comments										

Notes

Survey No. – Start from 1 each day at a port.
Boat Name – Name of the vessel as registered with the State Division of Boating & Ocean Recreation (DOBOR).
Boat No. - The US Coast Guard No. (six-digit number) or HA No. registered with DOBOR. Examples of USCG No. are 620742, 570765, etc. and examples of HA No. are HA 1332 CP, HA 1578 CT, and HA 6158 F. Please include following letters (CP, CT, F) after four numeric digits in HA No.

BF Boat—Does the boat have a BF registration (i.e. see BF label on the boat)? Y = yes, N = no.
Charter—Is it a charter boat, using the best judgment? Y = yes, N = no, U = unknown. A charter boat is a small for-hire vessel operating under charter for a price and specific amount of time. A licensed captain operates it and crew and the participants are part of a pre-formed group of anglers. Charters are usually closed parties (friends, family members, etc.) and not open to public. They can make full or half day trips.
Fishing—Based on the best judgment, does it look like that fishing is to be done or has been done? Y = yes, N = no, U = unknown.
# of People—The number of people that can be seen on board including captain and crew. If the number is large (> 9), just give the range, i.e. ≥ 10 or 10-20.
Activity—Include fishing, diving (SNUBA), snorkeling, sailing, and parasailing. Can be more than one activity.
Depart/Return Time—Report departing and returning part of a boat trip as separate entries. Record 6:00 am as 06:00 and 5 pm as 17:00.
Remarks—Include seeing fish on the boat, fish being unloaded from the boat, or flags being flown for catching the major "flagged" species.
Comments—Observations about how the day went such as when/if it was tricky to count boats.

Appendix B: Tables and Figures from Maui Test Surveys

Table B1 shows the results from the test survey at Maalaea harbor. The surveyors were at the site 10 hrs (6:00 to 16:00) for 8 days in August 2009. The trip durations ranged from 3 hr 41 min to 8 hr 30 min. Most trips began early in the morning with only one trip starting in the afternoon (second trip for Boat 4 for that day). Among 23 boat trips recorded (taken by six charter boats), there were only one missed depart time and one missed return time. The boat trip without a return time recorded was the second trip for a boat in that day, the only second trip in the records.

Table B1.-- Charter boat activity at Maalaea Harbor (Aug 23-30, 2009).

Boat	Date	Charter	Fishing	No of People	Activity	Depart	Return	Duration
Boat 1	23-Aug	Y	Y	10	fishing		13:23	
Boat 1	24-Aug	Y	Y	6	fishing	6:04	14:34	8:30
Boat 2	24-Aug	Y	Y	6	fishing	6:24	10:52	4:28
Boat 3	24-Aug	Y	Y	6	fishing	6:42	12:21	5:39
Boat 4	24-Aug	Y	Y	6-9	fishing/snorkeling	7:00	12:03	5:03
Boat 5	24-Aug	Y	Y	6	fishing	7:38	11:28	3:50
Boat 1	25-Aug	Y	Y		fishing	6:09	12:00	5:51
Boat 3	25-Aug	Y	Y		fishing	6:38	12:26	5:48
Boat 2	25-Aug	Y	Y	6	fishing	6:52	12:46	5:54
Boat 5	25-Aug	Y	Y	10	fishing	7:29	11:10	3:41
Boat 1	26-Aug	Y	Y	3	fishing	6:10	14:07	7:57
Boat 3	26-Aug	Y	Y	10	fishing	6:37	12:14	5:37
Boat 5	26-Aug	Y	Y	6	fishing	7:11	11:36	4:25
Boat 4	27-Aug	Y	Y	6	fishing/snorkeling	7:04	11:53	4:49
Boat 4	27-Aug	Y	Y	6-10	fishing	13:10		
Boat 2	28-Aug	Y	Y	6	fishing	6:26	14:01	7:35
Boat 1	28-Aug	Y	Y	10	fishing	7:00	11:48	4:48
Boat 6	28-Aug	Y	Y	6	fishing		9:48	
Boat 3	29-Aug	Y	Y	10	fishing	6:30	12:28	5:58
Boat 4	29-Aug	Y	Y	10	fishing/snorkeling	7:05	11:58	4:53
Boat 3	30-Aug	Y	Y	6	fishing	6:30	13:01	6:31
Boat 5	30-Aug	Y	Y	10	fishing	7:32	11:32	4:00
Boat 4	30-Aug	Y	Y	6	snorkeling/fishing	9:49	13:50	4:01

More than 70 fishing trips (taken by 17 charter boats) were observed at Lahaina Harbor for 7 days (August 16-22, 2009). About half of the trip records were with missing departure time or return time, presumably departing earlier than 6:00 or returning later than 17:00 (or 16:00 on some days when the surveyors only stayed until 16:00). For the trips with observed departure times, half of the trips left before 7:00 (actually all before 6:30). Significant number of boats left between 10:00 to 13:00 (not many between 7:00 and 10:00). Nine 2nd trips were observed, all departing between 10:00 and 13:00. The return times were spread evenly between 9:00 to15:00. Fewer boats returned between 15:00 and 17:00.

On 90% of observed boat trips, 6-9 people were on board (including captains and crew). This is consistent with the fact that charter boats carry a maximum of 6 patrons on charter trips in Hawaii.

On complete trips (showing observed departure AND return time), most trips lasted for 3-5 and 7-9 hours, indicating that full-day trips (8 hr) and half-day trips were common and ¾-day trips (6 hrs) were not as common.

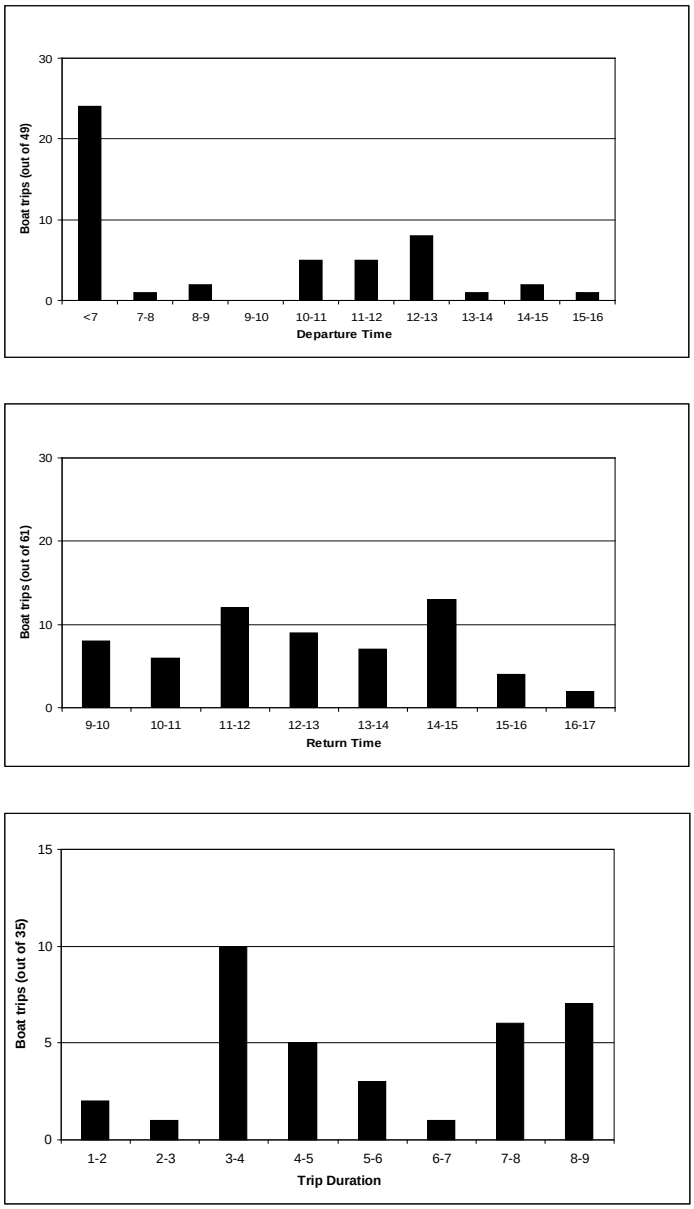


Figure B1.--Departure and return times and trip durations observed at Lahaina Harbor (August 16-22, 2009).

Appendix C: Tables for Catch and Release at Honokohau Harbor

Table C1.--Blue marlin catch and release recorded in the CML monthly report (CML) and charter desk fish report (HFN). As in Tables 1-4, adjusted catch and release are used for report rate calculations (to keep the maximum report rate = 1). Adjusted catch and release are mostly equal to HFN kept and release and are only replaced with CML kept and release when HFN values < CML values. The total adjusted catch (kept) is 270 and the total adjusted release is 1064.

Boat Name	HFN Kept	HFN Release	CML Kept	CML Release	Report Rate (Kept)	Report Rate (Release)
Boat 1	1	3	3	4	1.000	1.000
Boat 2	10	38	6	50	0.600	1.000
Boat 3	19	1	6	0	0.316	0.000
Boat 4	30	34	53	112	1.000	1.000
Boat 5	0	16	0	21		1.000
Boat 6	3	5	1	6	0.333	1.000
Boat 7	1	7	0	0	0.000	0.000
Boat 8	1	21	2	37	1.000	1.000
Boat 9	0	18	1	30	1.000	1.000
Boat 10	2	39	0	0	0.000	0.000
Boat 11	4	0	3	1	0.750	1.000
Boat 12	6	8	6	7	1.000	0.875
Boat 13	19	22	9	42	0.474	1.000
Boat 14	5	52	2	45	0.400	0.865
Boat 15	14	28	7	39	0.500	1.000
Boat 16	0	2	0	6		1.000
Boat 17	0	5	0	18		1.000
Boat 18	0	22	1	27		1.000
Boat 19	14	41	5	36	0.357	0.878
Boat 20	8	36	9	38	1.000	1.000
Boat 21	1	1	0	12	0.000	1.000
Boat 22	2	50	1	41	0.500	0.820
Boat 23	2	11	1	12	0.500	1.000
Boat 24	1	0	0	5	0.000	1.000
Boat 25	1	8	0	16	0.000	1.000
Boat 26	1	7	1	9	1.000	1.000
Boat 27	1	10	1	13	1.000	1.000
Boat 28	2	1	1	0	0.500	0.000
Boat 29	3	15	1	14	0.333	0.933
Boat 30	2	7	1	25	0.500	1.000
Boat 31	37	4	25	0	0.676	0.000
Boat 32	2	18	2	34	1.000	1.000
Boat 33	1	0	0	0	0.000	
Boat 34	3	1	0	1	0.000	1.000
Boat 35	9	36	7	52	0.778	1.000
Boat 36	2	38	5	23	1.000	0.605

Table C1 (continued)

Boat Name	HFN Kept	HFN Release	CML Kept	CML Release	Report Rate (Kept)	Report Rate (Release)
Boat 37	2	4	2	3	1.000	0.750
Boat 38	1	3	0	0	0.000	0.000
Boat 39	4	74	5	74	1.000	1.000
Boat 40	3	17	5	17	1.000	1.000
Boat 41	1	0	5	0	1.000	
Boat 42	2	20	0	14	0.000	0.700
Boat 43	0	23	0	28		1.000
Boat 44	0	1	0	2		1.000
Boat 45	8	0	6	0	0.750	
Boat 46	2	33	0	18	0.000	0.545
Boat 47	0	2	1	17	1.000	1.000
sum/mean	230	782	184	949	0.567	0.818

Table C2.--Weight for blue marlin at Honokohau Harbor in 2009.

Boat Name	HFN Kept	HFN Weight	CML Kept	CML Weight	Mean W_HFN	Mean W_CML
Boat 1	1	209	3	450	209.00	150.00
Boat 2	10	3329.5	6	1831	332.95	305.17
Boat 3	19	6169.5	6	1445	324.71	240.83
Boat 4	30	10129	53	12617	337.63	238.06
Boat 5	0		0			
Boat 6	3	779.5	1	450	259.83	450.00
Boat 7	1	157	0		157.00	
Boat 8	1	269	2	455	269.00	227.50
Boat 9	0		1	175		175.00
Boat 10	2	437.5	0	0	218.75	
Boat 11	4	721.5	3	841	180.38	280.33
Boat 12	6	2941	6	2535	490.17	422.50
Boat 13	19	5283	9	3523	278.05	391.44
Boat 14	5	2337.5	2	584	467.50	292.00
Boat 15	14	3256	7	2292	232.57	327.43
Boat 16	0		0			
Boat 17	0		0			
Boat 18	0		1	85		85.00
Boat 19	14	4748	5	2099	339.14	419.80
Boat 20	8	2173	9	2751.5	271.63	305.72
Boat 21	1	379.5	0		379.50	
Boat 22	2	328	1	150	164.00	150.00
Boat 23	2	899.5	1	450	449.75	450.00
Boat 24	1	347.5	0		347.50	
Boat 25	1	200	0		200.00	
Boat 26	1	111.5	1	149	111.50	149.00
Boat 27	1	458	1	458	458.00	458.00
Boat 28	2	963.5	1	698	481.75	698.00
Boat 29	3	853.5	1	451	284.50	451.00
Boat 30	2	488.5	1	399	244.25	399.00
Boat 31	37	6768	25	4599	182.92	183.96
Boat 32	2	689.5	2	689	344.75	344.50
Boat 33	1	235	0		235.00	
Boat 34	3	1368.5	0		456.17	
Boat 35	9	3614	7	3459	401.56	494.14
Boat 36	2	1510	5	968	755.00	193.60
Boat 37	2	404	2	406	202.00	203.00
Boat 38	1	118	0		118.00	
Boat 39	4	1263	5	1373	315.75	274.60
Boat 40	3	1803	5	1550	601.00	310.00
Boat 41	1	268	5	1267	268.00	253.40
Boat 42	2	1071	0		535.50	
Boat 43	0		0			
Boat 44	0		0			
Boat 45	8	2440.5	6	1901.5	305.06	316.92
Boat 46	2	872.5	0		436.25	
Boat 47	0		1	312		312.00
sum/mean	230	70394.5	184	51413	324.26	311.00

Table C3.--Striped marlin catch and release recorded in the CML monthly report (CML) and charter desk fish report (HFN). The total adjusted catch (kept) is 59 and the total adjusted release is 78.

Boat Name	HFN Kept	HFN Release	CML Kept	CML Release	Report Rate (Kept)	Report Rate (Release)
Boat 1	2	0	0	0	0.000	
Boat 2	0	1	0	0		0.000
Boat 3	2	0	2	0	1.000	
Boat 4	4	7	10	15	1.000	1.000
Boat 5	1	2	2	4	1.000	1.000
Boat 6	0	1	0	1		1.000
Boat 7	1	0	1	0	1.000	
Boat 8	0	1	0	3		1.000
Boat 9	1	0	0	1	0.000	1.000
Boat 10	1	0	0	0	0.000	
Boat 11	0	2	1	3	1.000	1.000
Boat 12	5	2	2	1	0.400	0.500
Boat 13	1	3	0	1	0.000	0.333
Boat 14	4	1	1	0	0.250	0.000
Boat 15	0	2	0	4		1.000
Boat 16	0	5	0	1		0.200
Boat 17	3	0	8	0	1.000	
Boat 18	0	1	0	1		1.000
Boat 19	0	1	0	0		0.000
Boat 20	0	3	0	0		0.000
Boat 21	1	6	0	4	0.000	0.667
Boat 22	0	1	1	3		1.000
Boat 23	6	0	0	0	0.000	
Boat 24			3	0	1.000	
Boat 25	1	0	1	0	1.000	
Boat 26	1	0	2	0	1.000	
Boat 27	0	1	0	1		1.000
Boat 28	1	0	0	0	0.000	
Boat 29	4	13	0	16	0.000	1.000
Boat 30	0	1	0	2		1.000
Boat 31	2	0	2	0	1.000	
Boat 32	0	2	0	0		0.000
sum/mean	41	56	36	61	0.533	0.652

Table C4.--Weight for striped marlin at Honokohau Harbor in 2009.

Boat Name	HFN Kept	HFN Weight	CML Kept	CML Weight	Mean W_HFN	Mean_CML
Boat 1	2	140	0		70.00	
Boat 2	0		0			
Boat 3	2	82	2	141	41.00	70.50
Boat 4	4	253	10	584	63.25	58.40
Boat 5	1	70	2	105	70.00	52.50
Boat 6	0		0			
Boat 7	1	98	1	100	98.00	100.00
Boat 8	0		0			
Boat 9	1	90	0		90.00	
Boat 10	1	70	0	0	70.00	
Boat 11	0		1	31		31.00
Boat 12	5	342.5	2	234	68.50	117.00
Boat 13	1	50	0		50.00	
Boat 14	4	340	1	80	85.00	80.00
Boat 15	0		0			
Boat 16	0		0			
Boat 17	3	236.5	8	521.5	78.83	65.19
Boat 18	0		0			
Boat 19	0		0			
Boat 20	0		0			
Boat 21	1	144.5	0		144.50	
Boat 22	0		1	60		60.00
Boat 23	6	534.5	0		89.08	
Boat 24			3	150		50.00
Boat 25	1	60	1	60	60.00	60.00
Boat 26	1	46	2	94	46.00	47.00
Boat 27	0		0			
Boat 28	1	102	0		102.00	
Boat 29	4	287.5	0		71.88	
Boat 30	0		0			
Boat 31	2	150	2	160	75.00	80.00
Boat 32	0		0			
sum/mean	41	3096.5	36	2320.5	76.28	67.05

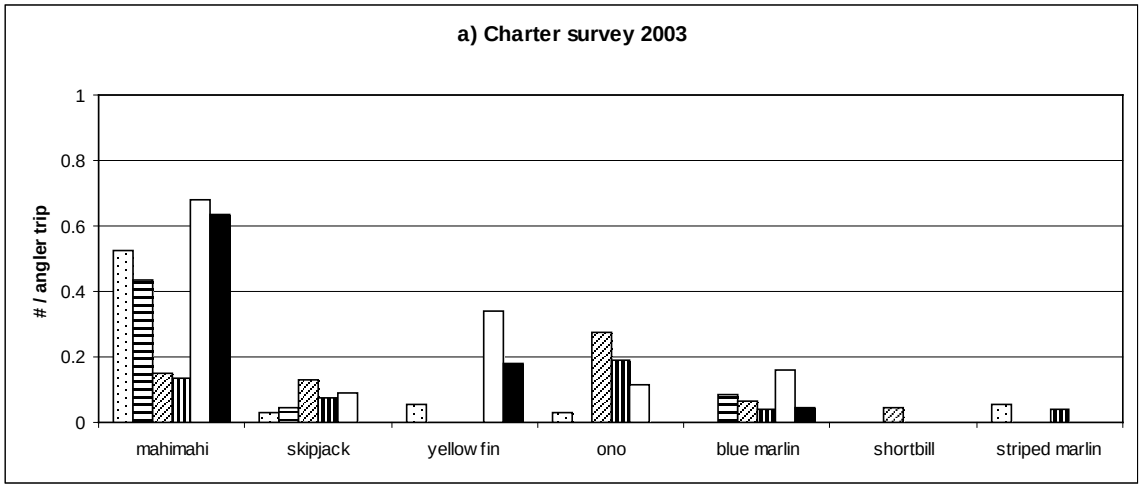
Table C5.--Spearfish catch and release recorded in the CML monthly report (CML) and charter desk fish report (HFN). The total adjusted catch (kept) is 153 and the total adjusted release is 123.

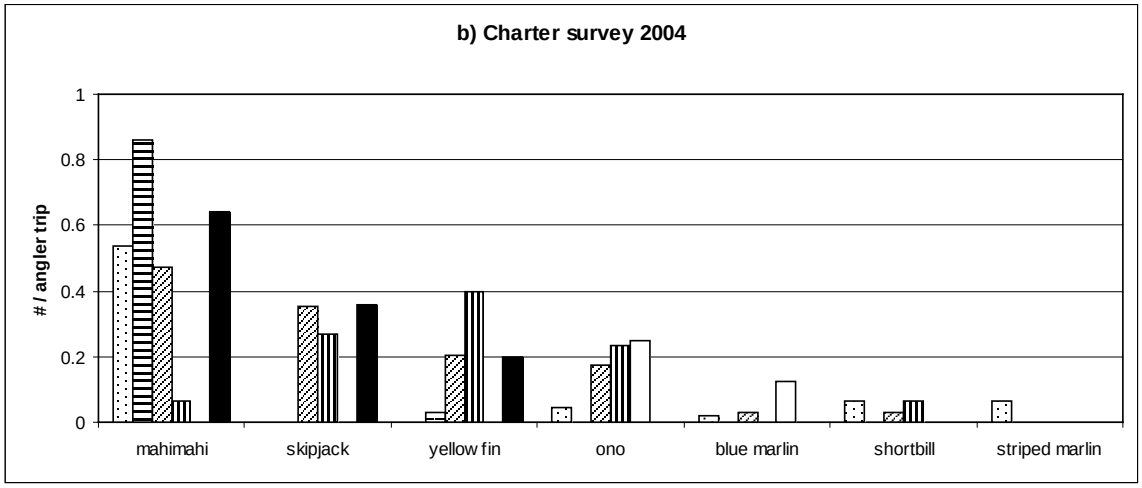
Boat Name	HFN Kept	HFN Release	CML Kept	CML Release	Report Rate (Kept)	Report Rate (Release)
Boat 1	0	1				0.000
Boat 2	2	6	1	10	0.500	1.000
Boat 3	7	1	0	0	0.000	0.000
Boat 4	9	0	37	12	1.000	1.000
Boat 5	0	2	5	1	1.000	0.500
Boat 6			0	1		1.000
Boat 7	0	1	0	0		0.000
Boat 8	1	2	6	4	1.000	1.000
Boat 9			1	0	1.000	
Boat 10	1	6	0	0	0.000	0.000
Boat 11	1	0	3	0	1.000	
Boat 12	2	2	2	7	1.000	1.000
Boat 13	4	2	0	1	0.000	0.500
Boat 14	5	3	4	1	0.800	0.333
Boat 15			3	2	1.000	1.000
Boat 16			0	5		1.000
Boat 17	9	4	2	2	0.222	0.500
Boat 18	4	0	8	0	1.000	
Boat 19	4	4	5	1	1.000	0.250
Boat 20	2	0	4	0	1.000	
Boat 21	2	0	0	0	0.000	
Boat 22	0	3	0	3		1.000
Boat 23	1	2	3	1	1.000	0.500
Boat 24	2	11	1	11	0.500	1.000
Boat 25	0	2	2	5		1.000
Boat 26	9	0	0	0	0.000	
Boat 27	2	2	2	3	1.000	1.000
Boat 28	5	3	8	4	1.000	1.000
Boat 29	15	2	0	0	0.000	0.000
Boat 30	0	7	0	4		0.571
Boat 31	1	0	0	0	0.000	
Boat 32	3	6	2	2	0.667	0.333
Boat 33	0	8	0	10		1.000
Boat 34			0	2		1.000
Boat 35	4	0	3	0	0.750	
Boat 36	0	3	0	1		0.333
sum/mean	95	83	102	93	0.632	0.636

Table C6.--Weight for spearfish at Honokohau Harbor in 2009.

Boat Name	HFN Kept	HFN Weight	CML Kept	CML Weight	Mean W_HFN	Mean W_CML
Boat 1	0					
Boat 2	2	56	1	30	28.00	30.00
Boat 3	7	204.5	0		29.21	
Boat 4	9	317	37	1177.5	35.22	31.82
Boat 5	0		5	155		31.00
Boat 6			0			
Boat 7	0		0			
Boat 8	1	52	6	265	52.00	44.17
Boat 9			1	35		35.00
Boat 10	1	35	0	0	35.00	
Boat 11	1	38	3	93	38.00	31.00
Boat 12	2	79	2	80	39.50	40.00
Boat 13	4	130	0		32.50	
Boat 14	5	170	4	131	34.00	32.75
Boat 15			3	80		26.67
Boat 16			0			
Boat 17	9	280	2	93	31.11	46.50
Boat 18	4	140	8	265	35.00	33.13
Boat 19	4	155	5	180	38.75	36.00
Boat 20	2	60	4	111	30.00	27.75
Boat 21	2	75	0		37.50	
Boat 22	0		0			
Boar 23	1	35	3	118	35.00	39.33
Boat 24	2	60	1	25	30.00	25.00
Boat 25	0		2	75		37.50
Boat 26	9	330	0		36.67	
Boat 27	2	69	2	61.5	34.50	30.75
Boat 28	5	168.5	8	270	33.70	33.75
Boat 29	15	531.5	0		35.43	
Boat 30	0		0			
Boat 31	1	38	0		38.00	
Boat 32	3	104.5	2	66	34.83	33.00
Boat 33	0		0			
Boat 34			0			
Boat 35	4	132.5	3	107	33.13	35.67
Boat 36	0		0			
sum/mean	95	3260.5	102	3418	35.09	34.04

Appendix D: Figures for Catch Rates at Lahaina, Maalaea, and Nawiliwili





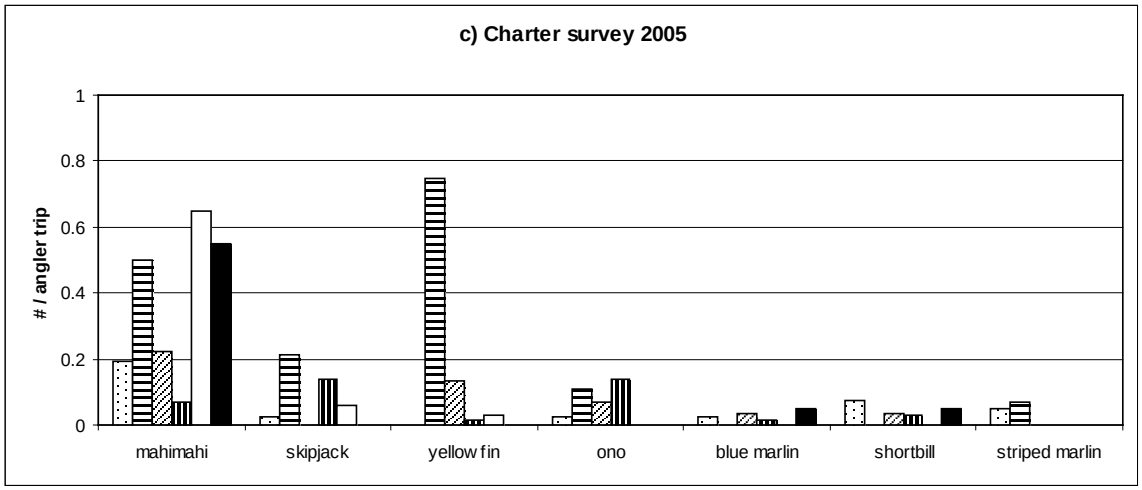
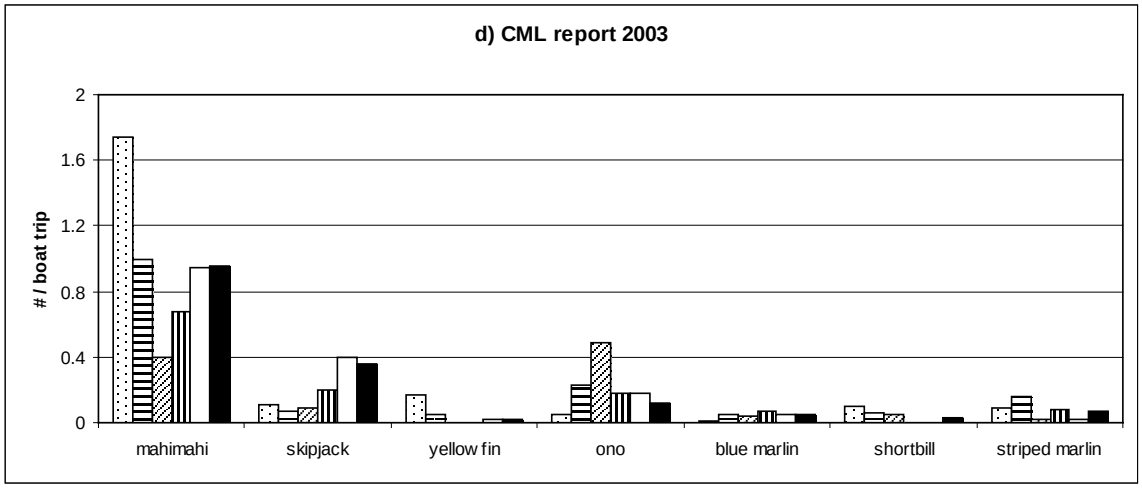
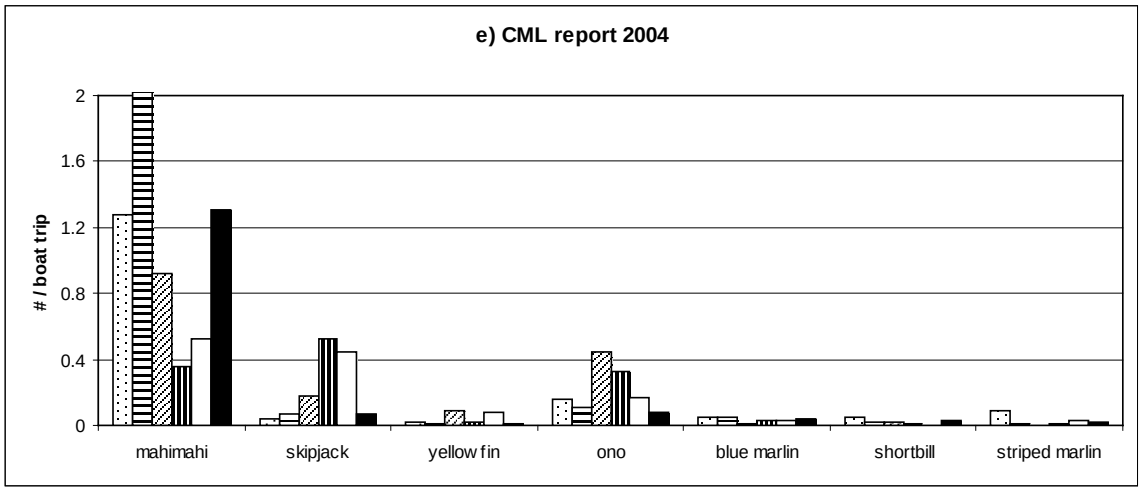


Figure D1.--Catch rate estimates from the HMRFS for-hire survey (a-c) and from the CML reports (d-f) at Lahaina Harbor (2003-2005).





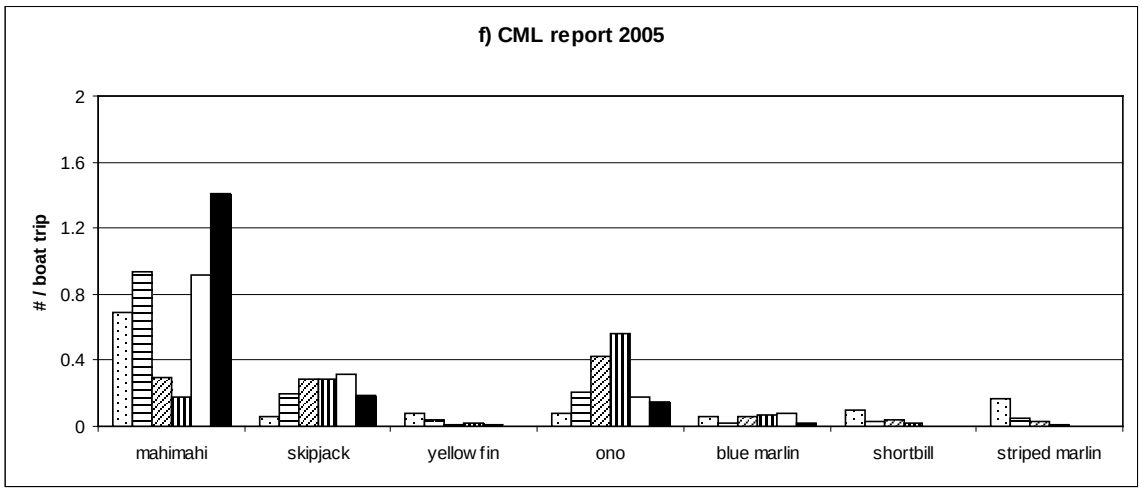


Figure D1 (continued)

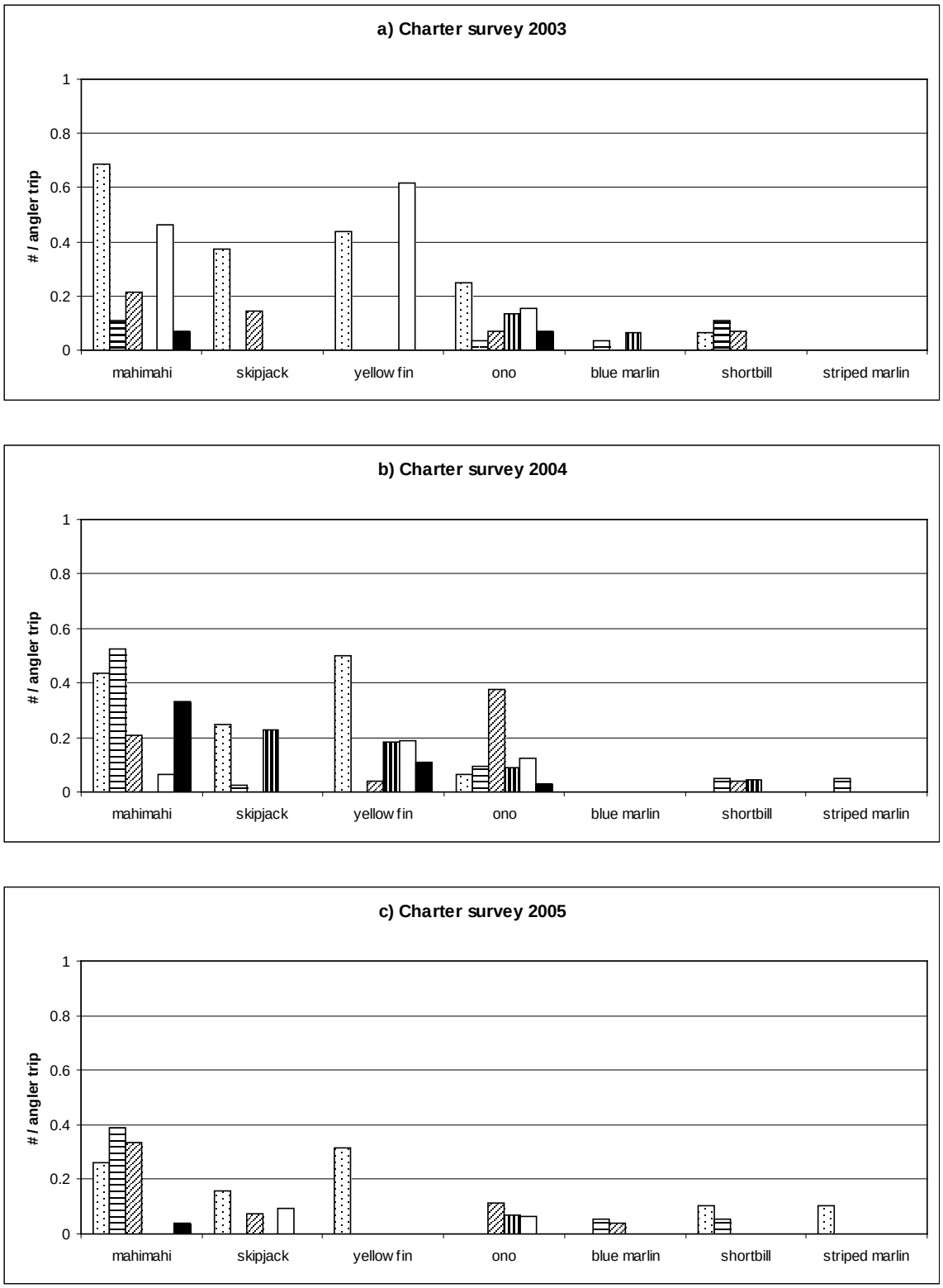
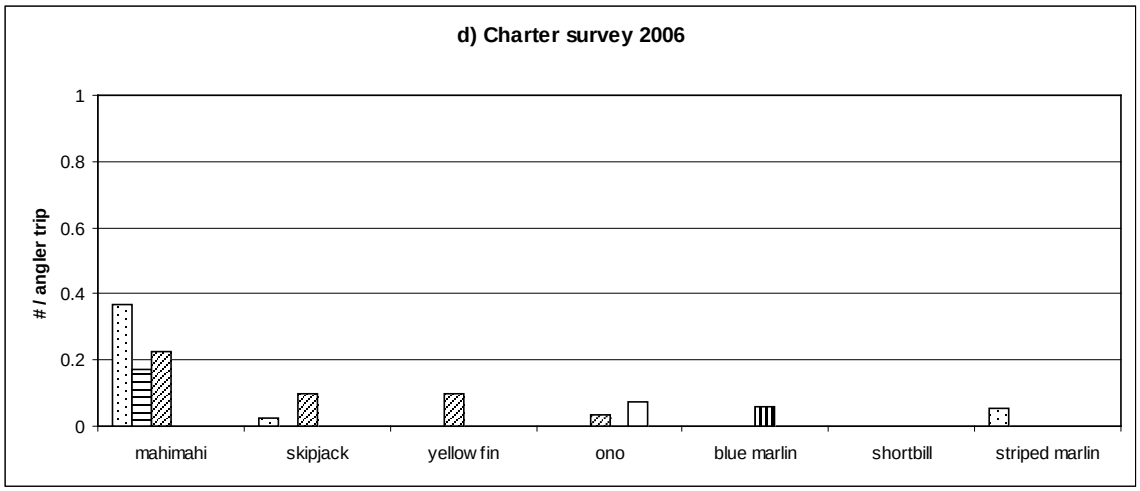
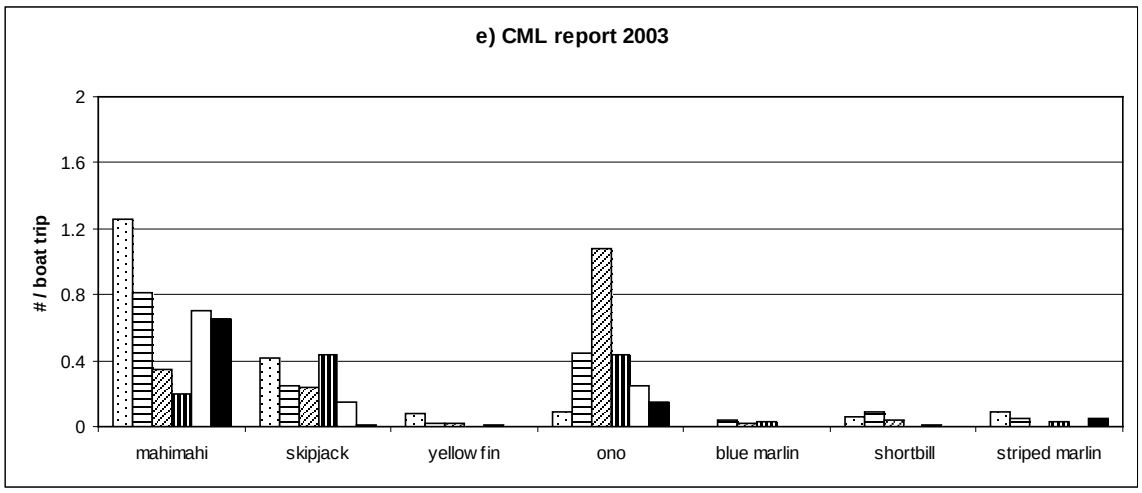


Figure D2.--Catch estimates from the HMRFS for-hire survey (a-d) and from the CML reports (d-h) at Maalaea Harbor (2003-2006).





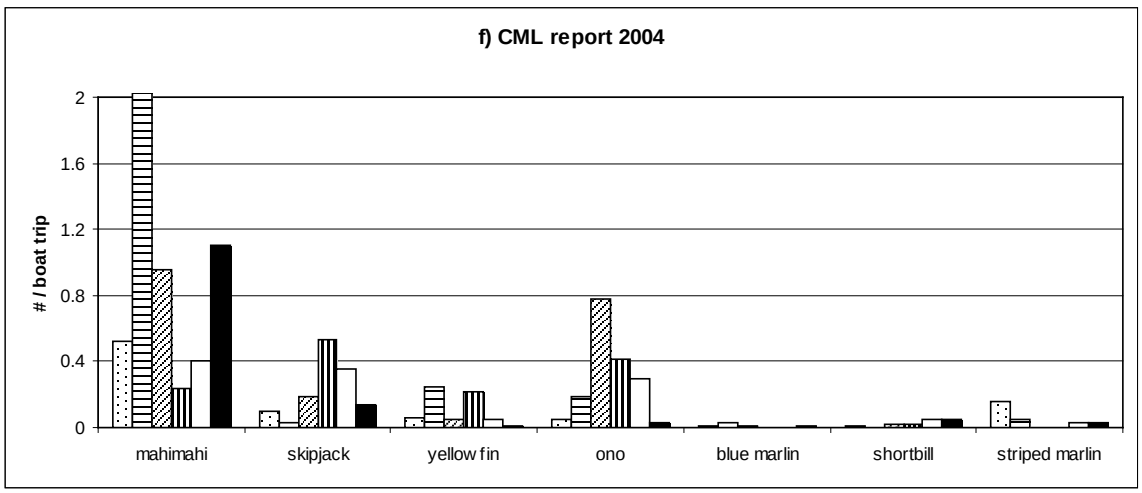
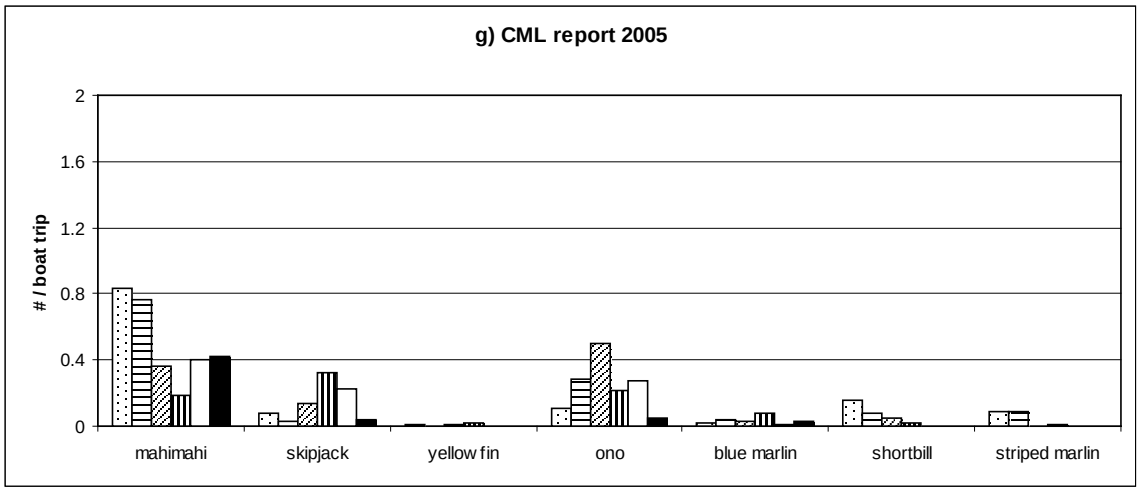


Figure D2 (continued)



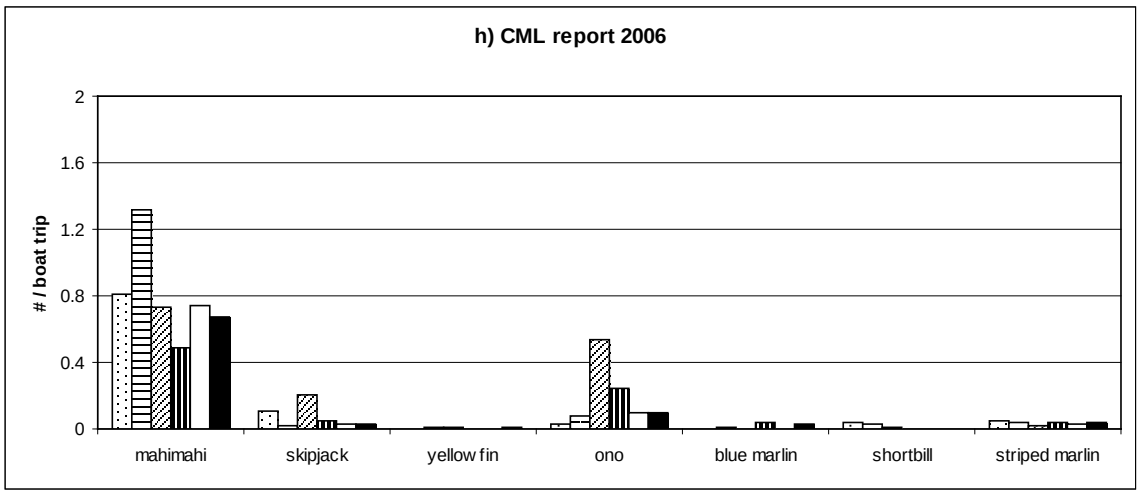


Figure D2 (continued)

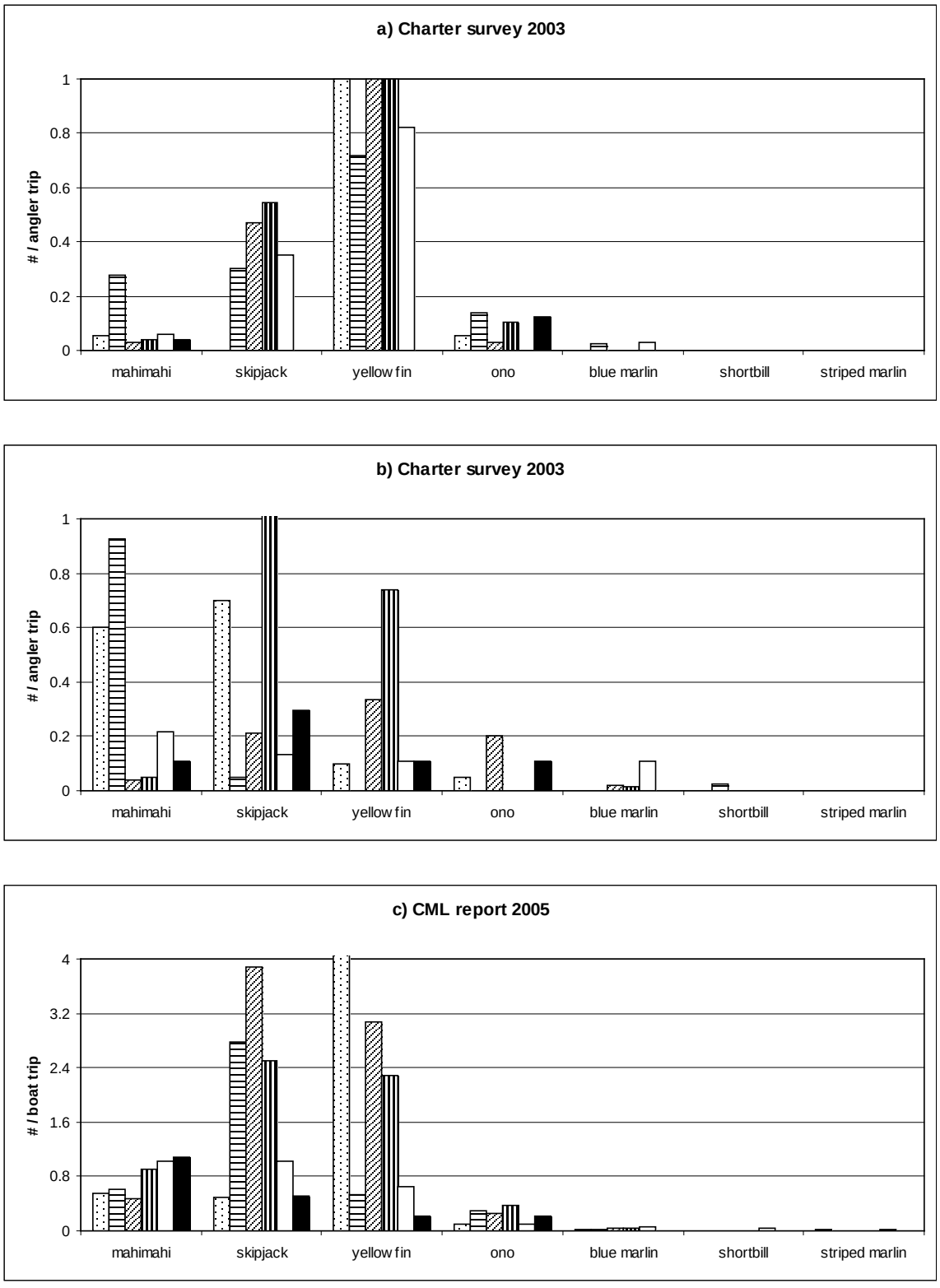


Figure D3.--Catch rate estimates from the HMRFS for-hire survey (a-b) and from the CML reports (c-d) at Nawiliwili Harbor (2005-2006).

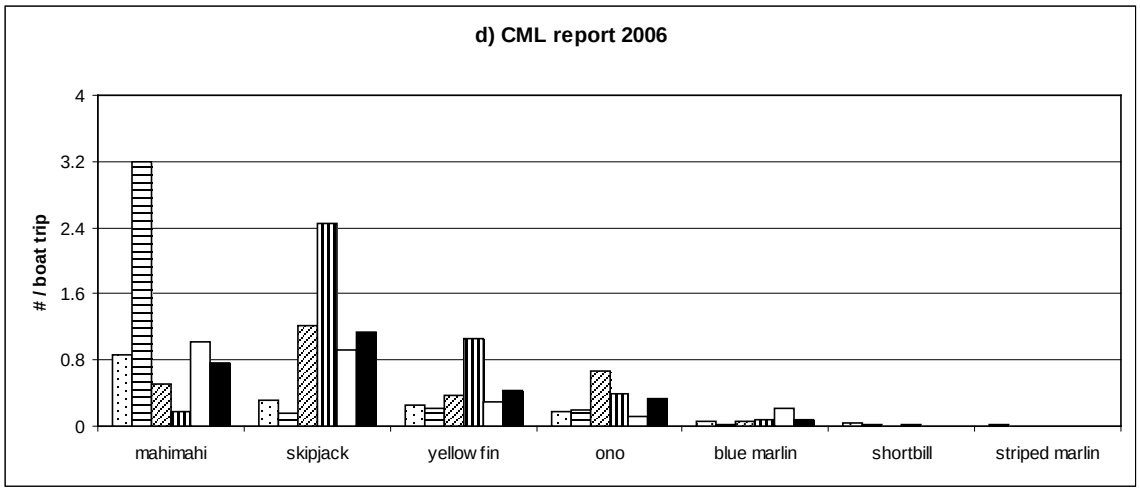


Figure D3 (continued)